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## THE GENUS AMELANCHIER IN EASTERN NORTH AMERICA.

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(Plates 95 and 96.)

It is with some hesitation that the writer attempts a treatment of a genus which in the past has been subject to so much difference of opinion as has *Amelanchier*. His only excuse is that field and herbarium studies covering in a general way a period of sixteen years, but more especially of four years, have led him to conclusions in regard to specific identity, relationship, and nomenclature which differ rather widely from those generally accepted at present.

Between the years 1895 and 1898 the writer made a serious study of the shad-bushes of Central New York with the expectation that the results would be published at once; but on more extended study in herbaria the classification based on the local work was found to accord so poorly with what existed elsewhere that the idea of immediate publication was given up. Recent field work in eastern Massachusetts and also in Newfoundland, where the genus is especially well represented as to individuals, has revived interest in this problem, and much of the writer's spare time throughout the past year has been again devoted to *Amelanchier*. During the summer of 1911, in company with Prof. M. L. Fernald and Mr. E. B. Bartram, he collected in Newfoundland about 132 numbers of *Amelanchier*. This material, together with that in the Gray Herbarium, kindly placed at the writer's disposal by those in authority, and the material in the Herbarium of the New England Botanical Club, has furnished the immediate basis for this

paper. In addition, the writer has seen the material in the Herbarium of the Missouri Botanical Garden, the herbarium of the Philadelphia Academy of Natural Science, the National Herbarium, the herbarium of the New York Botanical Garden, and the herbarium of Cornell University. The principal cause of most of the difficulty experienced by students of *Amelanchier* in the past in drawing specific lines, is to be found undoubtedly in the wonderful variability which seems to exist within the genus, a variability so extreme that rarely did it seem possible to find two plants as much alike as specific identity in other groups would demand. Indeed, if the sheets of any large collection are sorted on any assumed basis, almost as many transitional sheets will be found as sheets typical of the supposed species. For this reason many taxonomists have been inclined to believe that no real specific lines exist, at least so far as the eastern species are concerned. Because of this wealth of form two courses have seemed possible; a conservative treatment in which a very few species, sometimes only one, may be recognized; or a radical one in which a great many species are supposed to exist.

In attempting any treatment of the genus the first point to be decided is the significance of this wealth of form. In the past it has been usually interpreted as real variation, and, if such, we must admit that to draw specific lines would be impossible. Recent activity in the study of heredity has shown, however, that hybridization in nature, especially in certain groups, is much more common than was supposed. Moreover, the Mendelian theory has supplied a method of testing supposed hybrids by growing the offspring through several generations. By means of such tests it has been shown in many cases that so-called intermediates are due to hybridization. It has also been shown that many so-called intermediates are really not intermediates as far as the individual characters are concerned, but are made up of the characters of the two parents combined according to the law of combinations and permutations until all possible combinations exist. The question may be legitimately raised, therefore, as to whether the multitudinous forms in *Amelanchier* are hybrids, and, if so, as to what are the true species.

The writer began the present study under the belief that the wealth of form was due to true variation; but with more material at hand, and especially in recent years since the possibility of hybridization has been more in mind, a surprisingly great number of cases has been

found where characters plainly appear to have been recombined. So frequent have these cases become that it seemed desirable to work out a treatment of the genus based on the idea that the so-called "intermediates" are hybrids. The present paper is a result of this endeavor. The first and most difficult problem was to determine what were the real species, and what the hybrids. At first too few species were recognized, thus making necessary the interpretation of some plants as hybrids in regions where at least one of the parents was not known to exist.

After several trials, however, the present treatment was settled upon for the following reasons: because the groups of sheets representing each species obtained in this way seemed to be natural groups the individuals in which differed not more from each other than do individuals in species of other genera; because the range of each species so obtained was a natural range, and not local; because most intermediate specimens could be interpreted as recombining characters of the true species; because all characters were accounted for, so that supposed hybrids simply recombined old characters, and no new characters appeared in these intermediates; and because the range obtained was such that hybrids were not accredited to regions in which the parents did not exist. Unfortunately the time required to grow plants of *Amelanchier* in order to test the hybrids, and the fact that the writer is not conveniently located for such work, has made it impossible to test the hybrids assumed to exist. This paper must, therefore, be regarded as a provisional treatment based upon the *hypothesis* that the products of hybridization within this genus are extremely common. Indeed, such products of hybridization seem so common that in every large herbarium thus far studied the number of sheets to be considered of hybrid origin is about one-third of the whole. This great number of hybrid forms may seem to some unduly large when it is considered that Mendel<sup>1</sup> and others have shown that, in nature, there is a strong tendency for the gross mass of individuals representing species and hybrids to return to the two specific forms. It may seem that we are assuming unreasonably frequent crossing to occur. It is probable, however, that many forms which are the results of hybridization come true to seed. That certain new forms thus produced may come true to seed is not opposed to the Mendelian

<sup>1</sup> Mendel: — See Mendel's Principles of Heredity, by Bateson, p. 58, 1902.

theory of segregation as would at first seem to be the case. According to the Mendelian theory, all unit characters tend to segregate with successive generations produced from a hybrid, and to return to the pure parent form, but this does not mean that this ultimately pure character will necessarily be combined with another ultimately pure character from the *same parent*. In many cases there will be a combination of an ultimately constant character of one parent with a similarly constant character of the other parent so that all the resulting offspring in succeeding generations will be alike and will possess both of these characters. As the ordinary expression goes, it will be a permanent hybrid, and thus a new race will be established. Whether we should attempt to distinguish all of these new races by names, or simply refer to them as hybrids of "so and so" in which "such and such" characters of each parent are represented, is an open question. Considering the uncertainty, without culture, as to whether the various supposed hybrids breed true or not, it has seemed to the writer greatly in the interest of clearness to refrain from giving them names.

Thus the present treatment will still be disappointing to those who, like most of us, would like to be able to refer every specimen to a definite category. The writer believes, however, that this may be more nearly accomplished under the present treatment than under any other method of treating *Amelanchier* of which he is aware. We now have eight well defined categories bearing specific names. Other specimens which do not fall into these may be definitely labeled as hybrids<sup>1</sup> between some two of these parents. If the hybrids were described as species, a very large number of categories would be required to represent the various Mendelian combinations, and thus these categories themselves would differ from each other to such a slight degree as to render the classification unusable in actual practice. *Amelanchier*, like *Rubus*, is a group in which it will never be possible to have the clearly cut condition found in so many genera where specimens will fall easily into one or another specific category.

<sup>1</sup>The word hybrid is here used in a sense, common in taxonomy, but differing from that adopted by the modern plant breeders. It signifies any individual which is the result of crossing and which presents some of the traits of one parent side by side with some traits of the other parent. It may or may not breed true. The Mendelian students, on the other hand, use the term *hybrid* to denote an individual of the Dr group, which will not breed true but which will segregate in successive generations.

Incidentally it may be interesting to note here that some relation seems to exist between the frequency of crossing and the disturbance of natural conditions. Hybrids of both *Amelanchier* and *Rubus* seem more abundant in places where recent fires or recent clearing of the land have disturbed the equilibrium of nature. The frequently dug-over railroad embankment is an especially favorable locality for such hybrids in *Rubus*.

If it is difficult to determine what are species and what are not species in the genus *Amelanchier*, it is no less difficult to determine what names should be applied to the species recognized. Synonymy here is very extensive and very much involved. It is complicated by the fact that many of the species of the earlier authors were undoubtedly aggregates, and also by the fact that several specific names were based upon material from European gardens unlike any species now known to grow in the wild state. There is also some reason to believe that a few names were based upon hybrid specimens. It must be understood, therefore, that the nomenclature of the group, even after the present attempt to straighten it out, is still in an unsatisfactory state. The old types especially, if in existence, must be critically studied from the standpoint of the present treatment. A very serious attempt has here been made to interpret the older specific names; but, when that has seemed impossible, so that the retention of the name would demand an arbitrary application, thus creating a "permanent source of confusion and error,"<sup>1</sup> the name has been dropped.

The first name to be considered in connection with *Amelanchier* in eastern North America is the *Mespilus canadensis* of Linnaeus.<sup>2</sup> The original description is very brief and reads: "MESPILUS inermis, foliis ovato-oblongis glabris serratis, caule inermi.—*Mespilus inermis*, foliis subtus glabris obverse-ovatis. *Gron. virg.* 54. *Habitat* in Virginia, Canada." The reference in Gronovius reads as cited with the additional statement: "Frutex Mespilo affinis humilis, non ramosus nec aculeatus, foliis alternis subrotundis, eleganter serratis, & ad apicem rotundis, . . . *Clayt. n.* 60 & 295." In the *Systema Veg.* ed. 13 (p. 388, 1774) Linnaeus says:—"M. inermis, fol. ovato-oblongis glabris serratis acutiusculis. *Tenera lanata; adultior nuda. Racemi*

<sup>1</sup> Internat. Rules Bot. Nom., Art. 51, sect. 4.

<sup>2</sup> *Sp. Pl.*, ed. 1, p. 478 (1753).

*elongati.*” The citation from Gronovius, it would seem, can apply only to one or both of the two shrubby species growing in Virginia, both of which have rather blunt leaves and fine teeth, namely *Amelanchier oblongifolia* or *A. stolonifera*. Although “foliis subrotundatis” would seem to refer to *A. stolonifera*, a small-leaved plant of *A. oblongifolia* might have been at hand. The writer is indebted to Miss Alice Eastwood for a search among Clayton’s plants in the British Museum, but these numbers could not be found. The reference seems, therefore, of little value in determining the Linnean type. The words “foliis ovato-oblongis” in the original description suggest quite another plant from that suggested by the Gronovian reference, and the words “ovato-oblongis . . . serratis acutiusculis, racemi elongati” in the *Systema* still further suggest one of the arborescent species. That the hairy one of these two tree forms (*A. canadensis*, var. *tomentula* Sarg.), not the smooth one, was intended is made plain by the words “*tenera lanata.*” The writer is also indebted to Miss Eastwood for a comparison of material representing our various East-American species with the only existing specimen labeled *Mespilus canadensis* in the Linnean Herbarium. Quite unprejudiced by previous knowledge of the case, she reports that the Linnean specimen is more like material numbered III by the writer which was taken from a specimen of the hairy arborescent form; thus the Linnean descriptions and the specimen suggest the same plant. The writer feels, therefore, that the type of Linnaeus’ *M. canadensis* is reasonably well determined to be what has recently passed as *Amelanchier canadensis*, var. *tomentula*. This Linnean conception of *A. canadensis* was indeed quite generally followed by nearly all of the earlier writers, except Bigelow, in the various genera under which it was placed. Linnaeus, the younger, in 1781 (*Suppl.* p. 255), substituted the name *Pyrus Botryapium*, adding to the description the words “*Arbor . . . Folia . . . juniora tomentosa . . . Petala lineari-lanceolata . . .*,” thus making still more definite the conception of the arborescent hairy form. Only the description of the fruit as blue-black, juicy, sweet and pleasant is at variance with this interpretation. This (that Linnaeus meant the tree with pubescent leaves) was also the interpretation of Torrey & Gray in the *Flora of North America* (but not always that of Torrey, as shown by specimens in the Torrey Herb. which are mostly *A. laevis*). In the early editions of Gray’s *Manual*, however, there seems to have been a tendency, while retaining the name *A. canadensis* for

the form which is woolly when young, to apply the term "var. *Botryapium*" to a form with "leaves soon smooth." This is exactly opposite to the view recently held. A definite transfer of the name *canadensis* to the arborescent smooth species seems to have first taken place in the sixth edition of Gray's Manual. Since then this latter interpretation has been quite generally followed.

*Amelanchier canadensis* as interpreted by the writer seems to be the more common arborescent species in the Middle and Southern States, and, since this region furnished much material to the earlier botanists, it is not surprising that this species has an extensive synonymy. The writer has been unable to attribute any of the numerous published names to our smooth species, which is more common in the north, since each description states explicitly that the leaves were hairy when young. This smooth species is, therefore, here given the new name *A. laevis*.

Greater difficulty is experienced in the determination of names applicable to the shrubby species of *Amelanchier*. The shrubby and arborescent species were not clearly distinguished by the early authors, and in many cases the descriptions were so worded as to include both. Two names appear in the early synonymy of *Amelanchier* which have since been variously applied to different shrubby or even arborescent species. These are the *Crataegus spicata* of Lamarck,<sup>1</sup> and the *Pyrus ovalis* of Willdenow.<sup>2</sup> Both were described from garden material. The *C. spicata* was based on plants growing in the Jardin du Roi, and the *P. ovalis* on plants in the Berlin Garden. Plants have since been growing in the Berlin Garden, specimens from which have been from time to time sent out in exsiccati as *Amelanchier ovalis* or *A. spicata* (E. Koehne — Herb. Dend. No. 51 as *A. spicata* Hort. bot. Berol.) Those who have seen these specimens and the type specimen of *Crataegus spicata*, as well as specimens of our Eastern American stoloniferous fine-toothed *Amelanchier* agree that they all appear to be one and the same thing. Flowers and leaves in the exsiccati match those of this stoloniferous species as well as one could wish, as do also the flowers and leaves in the original descriptions. The original description of *C. spicata*, however, gives the height of the plant as from two to three times that of the native European species of *Ame-*

<sup>1</sup> Encyc., i, p. 84 (1783).

<sup>2</sup> Berlin Baumz., ed. 1, p. 259 (1796).

*lanchier*, which, figured out, would mean about 2–5 m. Willdenow gives the height as 2–2.5 m. In addition, Mr. Alfred Rehder has stated to the writer that the plant in European gardens commonly passing under the name *A. ovalis* is not low and stoloniferous but tall and fastigiate. It seems very reasonable to believe therefore that the plant imported at that early period and propagated in the European gardens was a constant form, of hybrid origin, in which the leaf- and flower-characters of *A. stolonifera* were combined with the habit of *A. oblongifolia*. For this reason both of these names have been considered as invalid for any species described in this paper.

Another name which has recently been taken up for an apparently artificial group of forms belonging to various species and including hybrids, is the *Amelanchier intermedia* of Spach.<sup>1</sup> This, also, was described from garden material (“...n’est pas rare dans les jardins. Elle est sans doute originaire de l’Amérique septentrionale”). The original description, which is lengthy, suggests the arborescent hairy species; “...les jeunes (feuilles) laineuse...Lanières calicinales...réfléchies après anthèse,...Petit arbre. Rameaux divariqués...Pétales longs d’environ 6 lignes...,” although the description of the leaf and of the form of the sepals is not very good for that species. In the Gray Herbarium, however, there is a specimen named *A. intermedia* by Spach himself. This is a sprig of flowering material and hence imperfect. The hypanthium is rather large for *A. canadensis*, and the sepals, though abruptly reflexed, are mostly longer and narrower than would be normal for that species. In one flower however there is a suggestion of the broad sepals of *A. canadensis*. Both the acute leaves and reflexed sepals exclude *A. oblongifolia*. The specimen should be interpreted, probably, as either an extreme form of *A. canadensis* or a hybrid of that species with *A. laevis*.

If we begin now with the shrubby species with coarse teeth we find that in 1803 Michaux described a *Mespilus canadensis*  $\gamma$  *rotundifolia*:<sup>2</sup> “arborescens; foliis sub-orbiculata-ovalibus, utrinque rotundatis.—in Canada.” The identity of this variety of Michaux has long been in doubt, and the name has been used by various authors for quite different plants. The original description is exceedingly brief and very indefinite. The word “arborescens” suggests something taller than a shrub, but Michaux used the term “arborea” on the same

<sup>1</sup> Hist. Veg. Phan., ii. p. 85 (1834).

<sup>2</sup> Fl. Bor. Am., i. p. 291.



page for var. *cordata*, and "fruticosa" for var. *oligocarpa*, so that "arborescens" might signify a high shrub. The writer has had access to a photograph made by Prof. Fernald of the Michaux type specimen in the Michaux herbarium (Mus. Hist. Nat. Paris) which, though not conclusive, seems more like the large-flowered, coarse-toothed species than any other; and this interpretation seems to have been that reached by other recent botanists who have studied the type. The Michaux variety was raised to specific rank and transferred to *Amelanchier* by Roemer<sup>1</sup> in 1847. Unfortunately in 1814 Pursh described a *Pyrus sanguinea*.<sup>2</sup> There has always been doubt as to the identity of this plant; and, so far as known, no specimen is in existence. Pursh cites as the only synonym the *M. canadensis*  $\gamma$  *rotundifolia* of Michaux, but he further says "tenuissime serratis...A small tree...berries red..." which are not the characters of Michaux's plant. Moreover the locality is given as, "In Canada and on the banks of the Columbia." Since that time attempts have been made to apply Pursh's name, but in a most diverse manner (see Lindley in Bot. Register t. 1171, and Loudon, Arb. et Fruct. p. 875). Evidently Pursh confused at least two plants, and evidently the only thing definite in connection with the Pursh name is the Michaux synonym, but that is definite and the name need not be a source of confusion; therefore the writer is inclined to believe, with Dr. Britton, that Pursh's specific name should be retained for Michaux's plant. Even if Pursh's name is not used, the name *rotundifolia* cannot be used as a specific name for our plant, as it is an earlier valid name for the native European species.<sup>3</sup>

The dwarf stoloniferous species with coarsely toothed leaves seems never to have been definitely recognized. In literature and in the herbarium it has been confused, sometimes with the species here called *Amelanchier sanguinea*, and sometimes with that here called *A. stolonifera*. The description of Blanchard's *A. erecta*<sup>4</sup> at first glance

<sup>1</sup> Fam. Nat. Syst. Rosif., p. 146.

<sup>2</sup> Fl. Am. Sept., p. 340.

<sup>3</sup> There is said to be a specimen of "*A. alnifolia*," which went through Pursh's hands, in the Lewis and Clark set at the Philadelphia Academy of Natural Science. If so, this may have given rise to the entry in Pursh's flora of the Columbia River locality. But since the specimen is reported not to have been named by Pursh, and since there is no reference in the Flora to this specimen, it is simply an inference that this specimen represents the *Pyrus sanguinea* of Pursh's Flora. (See Robinson & Greenman, in Thos. Meehan, Proc. Acad. Nat. Sc. Philadelphia, Jan., 1898).

<sup>4</sup> Torreya, vii. p. 101.

suggests this species; especially that part in which the flowers are described as small, in close stocky racemes, with short stocky calyxlobes which are "reflexed-curved," and in which the plant is said to grow in colonies forming a thick hedge. The teeth of the leaves are described as coarse, which would indicate that it belonged to the present group. In reply to a letter in regard to the type, Blanchard writes that the specimens distributed by him may be taken as typical. The Blanchard specimens named *A. erecta* in the Gray Herbarium are quite diverse, both as to size of flowers and venation of the leaves, as well as to other details of general appearance. None of them from Vermont, the type region, have exactly the same leaf and inflorescence as our specimens of the dwarf species from elsewhere. The broadly oval, coarsely toothed leaves, mentioned in the description and seen in the specimens, suggest *A. sanguinea*, as do also the long pedicels and moderately long sepals. Except in one specimen, the petals also are somewhat longer than is typical of our species. The more irregular veins of Blanchard's plants suggest *A. stolonifera* or *A. laevis*, while the small flowers also suggest *A. stolonifera*. The height given (4-12 ft.) is greater than is to be found among typical plants of the present species farther westward. If Blanchard's North Westminster plants were of this species, they would extend the eastern range slightly, since we have no other specimens from east of Troy, New York, and northern Lake Champlain. All things considered, therefore, the name *A. erecta* seems of too questionable application to warrant its adoption for our plant. It is thus desirable to give the species a new name, and *A. humilis* has been chosen because of the low dwarf habit of the shrub.

In 1818 Nuttall<sup>1</sup> described *Aronia alnifolia* with a range given as from Ft. Mandan to the Andes, but otherwise no definite locality was cited. The description calls for a small leaf, rounded and toothed near the summit, somewhat acute at the base, and smooth at maturity. This might apply to a small leaved specimen of what is here called *Amelanchier florida*, but the leaves in that species are almost never acute at the base. It might, also, be one of several of the small-leaved western species recently segregated by Greene and others. In the Torrey herbarium there is a small fragment bearing four leaves and a bud, which bears the label, in Nuttall's hand, "Amelanchier

<sup>1</sup> Gen. Am. i. p. 306.

*alnifolia* R. Mts. a low shrub. The racemes long and erect." On it Dr. Gray has written, "Nuttall must mean his *A. pumila* for this." Those leaves are about 22–27 mm. long, are rounded at both ends or but slightly cuneate at the base, and there is some slight indication of tomentum still remaining. In the Herbarium of the Academy of Natural Sciences at Philadelphia there is a fragmentary specimen from the "Columbia River" labeled *Amelanchier alnifolia* Nutt. in Nuttall's handwriting. The summit of the ovary in this specimen is glabrous and the specimen may be *A. Cusickii* Fernald. At least, we are not warranted in saying that it is the same as the plant east of the Rocky Mountains. The writer sees no way of deciding what either of these plants really is, or what Nuttall had in mind when describing *Aronia alnifolia*. Unless more material named by Nuttall can be found, it seems impossible to make use of his name. The first name that does definitely apply to our present species is the *Amelanchier florida* of Lindley,<sup>1</sup> published in 1833. This was accompanied by a fine colored plate and a long description with notes. Both the plate and the description, but more especially the former, fit our plant very well indeed. There seems little if any doubt that Lindley had in mind the plant here called *A. florida*, and the Lindleyan name is, therefore, adopted for the plant under discussion.

The stoloniferous coastal species of dry soil has never received a distinctive name. It has passed variously as *Amelanchier oblongifolia*, *A. spicata*, and *A. ovalis*; but the first of these is a quite different plant, and the other two names have already been shown not to apply to any species known at present. In recent years it has formed the basis of the *A. spicata* of Britton's various works. Since no other valid name exists for the species it may be called *A. stolonifera* because of its peculiar habit.

The swamp species with alder-like habit has been very generally confused with other species. It seems to have constituted all of Ashe's<sup>2</sup> "*obovalis*" and a part also of Michaux's.<sup>3</sup> It was the *Pyrus ovalis* of Bigelow and Pursh, and the *Aronia ovalis* of Torrey's Flora of the Northern and Middle States. It constituted a part of the *Mespilus arborea* of Michaux, and of the *Amelanchier intermedia* of Britton's N. A. Trees, as well as a part of the *A. Botryapium* of Britton's

<sup>1</sup> Bot. Reg., t. 1589.

<sup>2</sup> Bot. Gaz., xxxv. p. 434.

<sup>3</sup> Fl. Bor. Am., i. p. 291.

Illustrated Flora and Manual. Its earliest distinctive name was the *A. Canadensis*  $\beta$  *oblongifolia* of Torrey and Gray.<sup>1</sup> Though the description is not distinctive, the specimens thus labeled in the Torrey Herbarium are fairly conclusive. There are two such lots of labeled material with foliage, and one with flowers only. The identity of the latter is uncertain, but of the other two, one is straight *A. oblongifolia* as here understood (Princeton, June, 1831); while the other bears two branches, one of which, a mere twig in flower only, is *A. humilis* (coll. Gray, Watertown, N. Y., 1833), and the other, which is a foliage specimen, is true *A. oblongifolia* (N. Carolina). The significance of the name *oblongifolia* is, therefore, fairly clear and the name should be applied to our plant. It was transferred to specific rank by Roemer in 1847.

In 1803 Michaux<sup>2</sup> described *Mespilus canadensis*  $\delta$  *oligocarpa*, with habitat "in America boreali," and characterized as "fruticosa: foliis oblongo-ovalibus, basi acutis, subtiliter serrulatis, brevi petiolatis: fructibus subsolitariis." This name has usually been interpreted as referring to our northern short-petioled few-flowered species, and this interpretation is undoubtedly correct, as shown by a photograph of the Michaux type made by Prof. M. L. Fernald. The type specimen is in the Michaux Herbarium at the Museum d'Histoire Naturelle, Paris, and a print of the photograph is in the Gray Herbarium. This varietal name of Michaux was not raised to specific rank, however, until 1847 (Roemer); meanwhile Tausch<sup>3</sup> had published his *Pyrus Bartramiana* in 1838. The identity of this latter plant has always been uncertain, though the original description very strongly suggested *Amelanchier oligocarpa*. It was based upon material in the Leibnitz garden grown from seed sent by Bartram from North America. In the Bernhardt herbarium at the Missouri Botanical Garden there are three sheets which bear very old printed labels on which are the names *Pyrus Neumanniana* Tausch, *Pyrus Wangenheimiana* Tausch, and *Pyrus Bartramiana* Tausch, and through the kindness of Professor Trelease the writer has had access to these sheets. These specimens are probably part of the original Tausch exsiccati cited in the original description as "Dendroth. exot.-boh. exs." and, therefore, should probably be considered as authentic. The specimen labelled *Pyrus*

<sup>1</sup> Fl. N. A., i. p. 473.

<sup>2</sup> Fl. Bor. Am., i. p. 291.

<sup>3</sup> Flora, xxi, pt. 2, p. 715.

*Bartramiana* bears also the additional information, "*Aronia praecox* Neumann, Bartrams Birnstrauch, Nordamerika, Zierstrauch. Blüht in Mai. Reift in August," and is pure unhybridized *Amelanchier oligocarpa* of the most typical sort. Tausch's name, being the earliest specific name, must be accepted for this species, which therefore becomes *A. Bartramiana* (Tausch) Roemer. Only one other synonym exists for this species, namely the *A. arguta* Nutt. described by Britton<sup>1</sup> from a sheet so named by Nuttall (collected on Mt. Wachusett, Mass.) and from material collected by Eggleston in Vermont (see Eggleston in *Torrey*, 5, p. 107, 1905). Eggleston states that the description was mainly taken from his No. 1119, Cedar Swamp, Fairhaven, Vermont, and Nos. 1960 and 1964, Blueberry Hill Bog, Rutland, Vermont. In the Gray Herbarium there is a duplicate type in Nuttall's handwriting labeled "*Amelanchier* \* *arguta*, White Mts., N. Hampshire, also on Wachusett Mt., Mass." This and the type specimen, which, through the courtesy of the New York Botanical Garden, the writer has also seen, are apparently in no way different from typical *A. Bartramiana*. The half-grown fruit is ellipsoid-ovoid as in *A. Bartramiana* when of the same age, and the sepals are fully 4 mm. long (4-5 mm.), not 2 mm. as Eggleston says. Eggleston's No. 1119, a portion of which is also in the Gray Herbarium, does have sepals about 2 mm. long and fine teeth on the leaves, but his Nos. 1960 and 1964 have sepals about 3 mm. long and the teeth as coarse as in ordinary *A. Bartramiana*. No essential difference in the shape of the fruit, which is young in all specimens, could be detected between the Eggleston specimens and *A. Bartramiana*. In the light of extended experience with the variation in the shape of fruit, size of calyx, and coarseness of leaf serration of this species in Newfoundland, the writer cannot but feel that in the present case the slight variation in the fruit, on which much emphasis has been placed, is of very minor importance. Moreover, there is a possibility that some of the Eggleston numbers above cited are hybrids with *A. laevis*. Some hybrids between these two parents have been collected from these same Vermont bogs. It seems best, therefore, to consider *A. arguta* a synonym of *A. Bartramiana*.

In addition to the above names which have been proposed for the East-American species of *Amelanchier*, the following names are in existence and should be briefly considered.

<sup>1</sup> Manual, ed. 3, p. 1076 (1907).

In 1783 Lamarck<sup>1</sup> described *Crataegus racemosa*. Various portions of the long description seem to exclude all the species except *Amelanchier canadensis*. The portion of this description which calls for a shrubby habit and leaves glabrous beneath at maturity suggests either an extreme form of *A. canadensis* or a hybrid of this species with some other. This name does not, therefore, in any case, affect the valid nomenclature of our species.

In 1785 Marshall<sup>2</sup> described *Mespilus nivea*. Various characters in the description exclude all species except *Amelanchier canadensis* and *A. oblongifolia*. The writer finds himself unable to decide which of these species was intended. If the plant was *A. oblongifolia* then this would be an earlier name for that species.

In 1796 *Crataegus amoena* was proposed by Salisbury<sup>3</sup> in place of the *Mespilus canadensis* of Linnaeus. No description was given, but simply the citation of the Linnean synonym.

In 1803 Michaux<sup>4</sup> published *Mespilus canadensis*  $\alpha$  *obovalis* from "Carolina inferiore." The description is very brief and the type specimen has not been seen by the writer, but various circumstantial evidences point strongly toward *Amelanchier oblongifolia* as the species intended. The description says "humilior; foliis oblongiuscule obovalibus." This statement, combined with the statement of Ashe that *A. obovalis* (i. e., *A. oblongifolia*) is the plant to be expected along the coast through South Carolina, suggests an identity with *A. oblongifolia*. A photograph made by Prof. M. L. Fernald of the type specimen is less reassuring. The label bears the inscription "abris. de deux pieds de haut. Carolines," which suggests *A. stolonifera*; and while one twig bears the hypanthium of *A. stolonifera*, another twig has petals like *A. oblongifolia*, and a third twig bears leaves which might belong to either species, though typical of neither. The identity of Michaux's variety, therefore, still remains doubtful.

In 1803 Michaux described also *Mespilus canadensis*  $\beta$  *cordata*. The description, "arborea: foliis cordato-ovalibus, conspicue acuminatis," very strongly suggests *A. canadensis*, and a photograph of the type specimen made by Fernald leaves no doubt that this is the proper interpretation. *A. canadensis* is, of course, the earlier name.

<sup>1</sup> Encyc., i. p. 84.

<sup>2</sup> Arbust, p. 90.

<sup>3</sup> Prod., p. 357.

<sup>4</sup> Fl. Bor. Am., i. p. 291.

In 1810 *Mespilus arborea* was described by Michaux.<sup>1</sup> The long, detailed descriptive account and the plate leave little doubt that his plant was the *M. canadensis* of Linnaeus. This account is, in fact, the best one of this species in literature. With the exception of the rather sweeping statement that the species is found throughout the United States (which, of course, in those days meant the Eastern United States) as well as in Canada, except in the lower parts of the two Carolinas and in Georgia, the original description seems to describe only typical *Amelanchier canadensis*. Michaux's statement of range must have included *A. laevis* either inadvertently or because of a lack of familiarity with the shad-bushes of New England.

In 1825 *Aronia subcordata* Raf. and *Malus microcarpa* Raf. were published by DeCandolle<sup>2</sup> as possible synonyms of his *Amelanchier ovalis*  $\beta$  *subcordata* ("Aronia subcordata Raf.? in litt. Malus microcarpa Raf! dec. (v. s.)." *A. ovalis*  $\beta$  *subcordata* of DeCandolle was probably *A. canadensis*, and therefore the Rafinesquean names become synonyms of the Linnean species.

In 1836 a plant was described from northern Kentucky by Riddell<sup>3</sup> under the name *Aronia latifolia*. From the description one would judge this to have been *Amelanchier sanguinea*; but there exists a small flowering specimen in the Torrey Herbarium at the New York Botanical Garden which from handwriting and locality is undoubtedly a duplicate type. After considerable study the writer is inclined to believe this specimen to be a hybrid of *A. humilis* with *A. laevis*. This interpretation seems reasonable, too, because no specimens of *A. sanguinea* have been seen by him from either Kentucky or southern Ohio.

In 1838 Tausch<sup>4</sup> described *Pyrus Neumanniana* and *P. Wangenheimiana* based on material growing in the Leibnitz garden at Prag. These two names have long been a puzzle to botanists. The two sheets already referred to as in existence in the Bernhardt Herbarium at St. Louis are, therefore, of great importance in this connection. According to the writer's judgment they are both hybrids. The hairy petioles and peculiar teeth, as well as leaf-apex, of the mature leaves on the specimen labeled *P. Wangenheimiana* suggest *Amelanchier*

<sup>1</sup> Hist. Arb. Am. Sept.

<sup>2</sup> Prod., ii. p. 632.

<sup>3</sup> Sup. Cat. Pl. Ohio, p. 24.

<sup>4</sup> Flora, xxi. pt. 1, Beibl. p. 76, and pt. 2, p. 714.

*canadensis*; but the texture and general outline of the mature leaves, the lack of dense tomentum at flowering time, and the long narrow sepals suggest *A. laevis*. It is probably a hybrid of these two species. The specimen labelled *P. Neumanniana* seems to be a hybrid of *A. Bartramiana* with some other species. The acute leaf-base and general outline suggest *A. Bartramiana*, while the long petioles and the teeth suggest possibly *A. laevis*.

In 1908 Britton<sup>1</sup> described *Amelanchier alabamensis* from material collected by F. S. Earle and C. F. Baker three miles south of Auburn, Alabama. The writer has seen this material which was distributed by Earle and Baker, both the type specimen and also that which was sent to several other herbaria, but is still unable to form any satisfactory opinion regarding it. At flowering time the young leaves, hypanthium and sepals are like *A. canadensis*, but the summit of the ovary is hairy. The mature leaves are not distinctive but are more like those of *A. canadensis*. Nowhere in any of the herbaria studied by the writer are there other specimens which will match these. Thus one is strongly forced toward the opinion that *A. alabamensis* is not a good species of the same grade as those with wide distribution, and that it is to be explained as a local hybrid or as a local environmental variety. Before this conclusion is finally reached however, a more extended search in the Southern States should be made, for this region is one from which little material of *Amelanchier* finds its way into the herbaria.

1907 Blanchard<sup>2</sup> described *Amelanchier saxatilis*, and in the Gray Herbarium there are duplicates of the type (*Blanchard*, Rocky bank of Connecticut, Bellows Falls, Vt., near Depot, 1907, Set. 1, type). These plants are very difficult to understand, for they are not typical of any species recognized in this paper. They may possibly represent a hybrid between *A. laevis* or *A. canadensis* and *A. humilis* or *A. stolonifera*. There is, however, a suggestion of *A. Bartramiana* about the plant, as seen in the dentation of the leaves, in the shape of the young fruit and of the calyx, and in the enlarged base of the style. This plant needs more study in the field.

In 1908 Robinson<sup>3</sup> described *Amelanchier oblongifolia*, var. *micropetala*, a form with small narrow petals, from the Blue Hills in eastern

<sup>1</sup> N. A. Trees, p. 439.

<sup>2</sup> Torrey, vii. p. 99.

<sup>3</sup> RHODORA, x. p. 33.



Massachusetts, from Nantucket, and from several localities in Connecticut. Since then apparently the same form has been collected by F. S. Collins at Eastham, Massachusetts. These forms certainly are perplexing. After a study of the herbarium material and of the plants growing on the Blue Hills the writer is inclined to believe that the small-flowered forms are hybrids between *A. oblongifolia* and *A. stolonifera*. The reasons for this belief are as follows:—1. Both species grow upon the Blue Hills (*A. oblongifolia* in the damp pockets). 2. Many plants on the Blue Hills otherwise similar to the micropetalous plants have larger petals. 3. The micropetalous plants there differ considerably in foliage. 4. In the majority of such micropetalous plants the foliage is more like that of *A. stolonifera* as to the number of the veins. 5. The herbarium specimens, collected in the Blue Hills, and having small petals, may be sorted into two piles, one with the coarser teeth of *A. stolonifera* and the other with the fine teeth of *A. oblongifolia*. 6. The very globular young fruit of most of the micropetalous plants, on which there is a very short hypanthium, is exactly like that of *A. oblongifolia*. 7. The summit of the ovary is usually glabrous like that of *A. oblongifolia*. 8. On the Blue Hills the plants grow in various soils: either on exposed dry rocks with *A. stolonifera*, or in damp pockets accompanied by typical *A. oblongifolia*; on Nantucket, according to Bicknell they grow “in low grounds about the borders of swamps as well as on the dry moorland and in pine barrens.” One of the Connecticut plants was from “dry ground,” another from “thin soil on ledge of rocks,” and another from “dry sandy soil.” This suggests a possible Mendelian combination of dry and wet soil preferences. 9. Both Dr. Robinson and Mr. Bicknell have said that “intermediate” forms occur between var. *micropetala* and *A. oblongifolia*. These might well be other Mendelian combinations. Intermediates of this kind are certainly quite numerous on the Blue Hills. 10. On these hills the plants are low, but while some have the stoloniferous habit of *A. stolonifera*, others have the cespitose habit of *A. oblongifolia*. 11. The summit of Great Blue Hill has been recently cleared and in some places burned, a condition which in Maine seems especially favorable for hybrids of *Rubus*, and in Newfoundland for hybrids of *Amelanchier*. 12. Between *A. oblongifolia* and *A. stolonifera* a distinguishing feature, in most cases, is the narrowness of the petals in the former species and the broadness in the latter species. There is often, also, in *A. oblongifolia* a tendency

toward reduction in the size of the petals. May not the small narrow petals of var. *micropetala* be the *oblongifolia* character intensified by crossing?

The micropetalous plants of Nantucket have recently (1911) been separated from those of the Blue Hills by Bicknell<sup>1</sup> under the name *A. nantucketense*. The writer can find in Bicknell's account little of diagnostic value to separate the two forms. Only the following statement by Bicknell seems distinctive: "I have not been able to convince myself that the low and small-flowered Juneberry which finds its home on ledges and exposed rocky places is the same as the seemingly very local and coastwise Nantucket shrub." The small-flowered Nantucket plant, like the small-flowered plants of the Blue Hills, seem more reasonably explained as hybrids of *A. oblongifolia* and *A. stolonifera*. In the series of Mendelian segregates the swamp character may be supposed to have been derived from *A. oblongifolia*, as was also the character of the glabrous summit of the ovary. The small narrow petals may represent an intensification of the *oblongifolia* type of petal as suggested in case of the Blue Hills form. The calyx lobes of *A. nantucketense* are described as "early reflexed," which suggests *A. stolonifera* rather than *A. oblongifolia*. In consideration of the plausibility of the present interpretation the writer is disposed to interpret the Nantucket plant as a Mendelian phase of a hybrid between these two common coastal species.

From the standpoint of geographical distribution the genus *Ame-lanchier* is interesting. It has been plainly shown by various writers, and more recently by Fernald in this country, that the chemical nature of the soil, within certain limits, is of great importance as an influencing factor in distribution.<sup>2</sup> In addition to the evidence already published, two summers in Newfoundland and one in Maine have convinced the writer of the importance of this factor in distribution. It is with reference to the presence or absence of calcium in the soil that the greatest influence on vegetation is seen. Soil free from calcium apparently soon becomes acid, and the question then is one

<sup>1</sup> Bicknell, Bull. Torr. Bot. Club xxxviii. p. 453.

<sup>2</sup> Unger: (title translated) Influence of soil on the distribution of plants as shown in the vegetation of North-eastern Tyrol (1836).

Kerner & Oliver: Nat. Hist. Plants, ii. p. 495.

Fernald: RHODORA, ix. p. 149 (1907).

Hilgard: Soils.

Rubel: Pflanz. geog. Monog. d. Berninageb.—Engler's Jahrb., xlvii. p. 1-616 (1911-1912).

largely of alkaline or acid soils; but not entirely that, since recent research has shown that calcium has also a peculiar power of rendering harmless various toxic substances in the soil. Furthermore, by pot cultures, Coville<sup>1</sup> has recently shown that certain plants, as for instance the blueberry (*Vaccinium*), cannot be grown successfully in soil containing calcium even in small quantities when thoroughly mixed with the soil. In the light of these experiments and field observations it is interesting to find that several species of *Amelanchier* show a decided soil preference. *A. sanguinea* is confined to the limestone belt of northern and central Maine, and to the calcareous regions in Vermont, in central New York and in Canada. *A. humilis*, also, is a plant of the calcareous regions of Vermont, New York and Canada. Likewise, *A. canadensis* may be a calciphile, especially in its northeastern range. This species is abundant in the calcareous region of New York State, but enters New England only in the limey western edge. In the isolated station at Pembroke, Maine, it was growing in company with several other calciphile plants, probably because of a local outcrop of limestone. *A. oblongifolia* and *A. stolonifera*, on the other hand, are distinctly non-calciphilous plants. They inhabit the granitic and sandy regions of coastal and central New England, and the coastal plain from New England southward, but extend up the various rivers where the coastal plain flora follows the sands and gravels far into the more limey interior. *A. stolonifera* is also found on the non-calcareous sandstone summits of certain mountains in Vermont, in the sand of Warren and Saratoga counties, New York, and possibly in the sands of the Great Lakes. In central New York *A. oblongifolia*, if its existence there should be corroborated, finds its most inland known limit; here a shrub with some characteristics of *A. oblongifolia* grows either in peat bogs or in special non-calcareous swamps. The most typical development of this shrub in Central New York is in a marsh in which occur the only stations in the Cayuga Lake Basin for the coastal *Lyonia ligustrina* and *Prunus cuneata*. *A. laevis*, on the other hand, shows no evidence of soil preference. It grows equally well in central New York, throughout New England, and throughout the various calcareous and non-calcareous regions of Newfoundland. *A. Bartramiana* likewise does not show a special preference for either calcareous or non-calcareous districts.

<sup>1</sup> Experiments in Blueberry Culture — Bull. 193, Bureau of Plant Industry, U. S. Dept. Agric. (1910).

In closing this general discussion, the writer must call attention to the desirability of much further field work in connection with the genus *Amelanchier*. Our knowledge of the region around Lake Superior, Lake Michigan, and Lake Huron, and of the Dakotas, Iowa, Minnesota, and Lake Winnipeg is especially weak, and in regard to the Southern States, also, information is sadly lacking. The present treatment can be considered only tentative, therefore, so far as these regions are concerned.

In the future much better specimens of *Amelanchier* should be made. The herbaria are now clogged and overloaded with flowering specimens unaccompanied by fruit or leaves. For accurate work these are worthless, and the writer cannot guarantee to name specimens of that sort accurately. To prepare good specimens collections should be made from the same plant at flowering time just as the first petals begin to fall, at the time when the fruit is half grown, and at the maturity of the leaves. Mature ripe fruit is nearly useless. The mature leaves are not absolutely necessary, but the other two collections are indispensable. If time and opportunity will allow, still other stages in development should be obtained, and in this respect Mr. W. M. Blanchard cannot be too highly praised for setting an excellent example. Full notes should be taken in regard to the habitat, habit, time of flowering and fruiting, and these should be appended to the label.

The following is a synopsis of the more important characteristics of the various species. For the drawings of leaves and young and old fruits of the different species the writer is indebted to the skill and generosity of Mr. F. Schuyler Mathews.

- A. Flowers racemose: leaves from acute to rounded or cordate at the base, conduplicate when young<sup>1</sup>; petioles slender, 8–25 mm. long: hypanthium and summit of the ovary various: base of the style abruptly inserted on the nearly flat summit of the ovary: fruit globular, ovoid, or ellipsoid.
- B. Teeth of the leaves coarse (on average leaves 3–5 (6) per cm.): veins conspicuous, usually straight, parallel, and close together, short intermediate ones few or none (*Ulmus*- or *Alnus*-like): summit of the ovary woolly: hypanthium open, saucer-shaped, constricted

<sup>1</sup> In the buds of the first seven species the leaves are conduplicate, and on emerging from the bud remain for some time closely folded together. Instead of being equitant, however, they are placed side by side in the peculiar manner shown in FIG. 5–H. In the eighth species, *A. Bartramiana*, the leaves are not folded, but more or less imbricated in the bud, as in FIG. 8–H. The leaves of this species, on emerging from the bud, are nearly flat (see Gray's *Man.*, ed. 7, p. 459). This is a strange difference to be found between species of the same genus, but a similar condition is found in plums and cherries.

- below on the very young fruit<sup>1</sup>: sepals revolute from the middle at the time when the petals fall.
- C. Margins of the leaf forming an angle at the apex: petals narrow or broad.
- D. Petals 11–20 mm. long, narrow: sepals 4 mm. long: hypanthium very open and flat: racemes more or less drooping: leaves oval-orbicular; upper veins, in typical specimens, running straight to the apex of the coarse spreading sharp teeth (not so in the var.): scrawny, slender, often arching, shrubs, 1.0–2.5 m. high; stems solitary or few together. 1. *A. sanguinea*.
- DD. Petals 7–10 mm. long, broad: sepals 2–3 (4) mm. long: hypanthium deeper: racemes erect or nearly so: leaves oval-oblong; veins usually becoming irregular just before reaching the margin; teeth less conspicuous, because of shorter acuminations, and more ascending, sometimes confined to the apex: more stiffly upright shrubs 0.3–1.2 m. high, growing in colonies (not clumps) from rhizome-like bases. 2. *A. humilis*.
- CC. Margins of the leaf forming a rounded or sub-truncate, rarely retuse, apex; blade broadly oval or oblong-oval; veins irregular near the margin; teeth usually fewer. 3. *A. florida*.
- BB. Teeth of the leaves fine (5–12 per cm. on average leaves); veins irregular, unequally distant, usually with frequent intermediate shorter ones (*Pyrus*-like); summit of the ovary, etc. various.
- C. Leaves densely white-tomentose when young, becoming green; lower pedicels 7–18 mm. long, in fruit 10–25 mm. long.
- D. Leaves rounded at the apex (rarely subacute): hypanthium large at flowering time, 3–5 mm. in diam.: sepals narrow, triangular or lanceolate, acute, erect or recurved from the middle at the time when the petals fall: petals short, 7–9 mm. long: shrubs.
- E. Hypanthium saucer-shaped, constricted below on the very young fruit: sepals recurved from the middle when the petals fall: summit of the ovary woolly, at least when young: leaves oval; veins 7–11 (average 8–9) pairs; teeth on average leaves 20–28 (32) on each side: stems 0.3–1.2 m. high, forming colonies as in *A. humilis*. 4. *A. stolonifera*.
- EE. Hypanthium campanulate, not constricted below on the young fruit: sepals mostly erect: summit of the ovary glabrous, rarely slightly woolly: leaves oblong; veins 10–15 (average 11–13) pairs; teeth finer, (20) 25–40 (45) on each side: stems 1.2–8 m. high, forming alder-like clumps. 5. *A. oblongifolia*.
- DD. Leaves short-acuminate: hypanthium small, 2.5–3 (3.5) mm. diam., campanulate, not constricted below on the young fruit: sepals broad, oblong-triangular, obtuse or abruptly acute or abruptly short-acuminate, reflexed from the base when the petals fall: summit of the ovary glabrous: petals elongated, 10–14 mm. long; shrubs or trees. 6. *A. canadensis*.
- CC. Leaves nearly or quite glabrous from the first, ovate, oval, or

<sup>1</sup> In some species of *Amelanchier* (*A. sanguinea*, *humilis*, *florida*, *stolonifera*, and *Bartramiana*), as the fruit matures, the hypanthium remains on the summit in almost its original saucer-shaped form during the period of growth just subsequent to the falling of the petals. Between the hypanthium and the ovary, in this case, there is therefore, a conspicuous constriction at this period. In other species (*A. canadensis* and *laevis*) the ovary seems to grow up into the hypanthium so that the latter is stretched around the summit of the young fruit. The constriction in these cases is, therefore, much less, or none at all. The condition in *A. oblongifolia* is somewhat intermediate. As the fruit grows older these distinctions become much less marked.

elliptical, and very acute or commonly short acuminate at maturity; brownish-purple, half-grown, and unfolded at flowering time: petals elongated (10–18 mm. long): summit of the ovary glabrous: hypanthium campanulate, slightly constricted on the very young fruit: sepals lanceolate, usually reflexed from the base when the petals fall: lower pedicels 15–33 mm. long, in fruit 30–50 mm. long: trees or tall shrubs.

7. *A. laevis*.

- AA. Flowers commonly solitary (1–3 together), not racemose: mature leaves from barely acute at the base to cuneate or tapering; imbricated in the bud, not conduplicate, flat or nearly so when young; petioles short and stout, 2–7 (10) mm. long: hypanthium more or less constricted below on the young fruit: top of the ovary woolly: base of the style more gradually enlarged into the ovary and woolly: fruit ellipsoid-ovoid; shrubs.

8. *A. Bartramiana*.

### 1. *A. SANGUINEA* (Pursh) DC.

*Mespilus canadensis*  $\gamma$  *rotundifolia* Michx., Fl. Bor. Am. i. p. 291 (1803), not *A. rotundifolia* (Lam.) Dum. Cours. Bot. Cult. ed. 2, v. p. 459 (1811). *Pyrus sanguinea* Pursh, Fl. Am. Sept., p. 340 (1814). *Aronia sanguinea* Nutt., Gen. Amer. i. p. 306 (1818). *Amelanchier sanguinea* DC., Prod. ii. p. 633 (1825); Britton, N. A. Trees, p. 439 (1908). *A. canadensis*  $\gamma$  *rotundifolia* T. & G., Fl. N. A. i. p. 473 (1840), in part. *A. rotundifolia* Roemer, Fam. Nat. Syst. Rosif. p. 146 (1847); Brit. & Brown, Ill. Fl. ii. p. 238 (1897); Brit., Man. p. 518 (1901). *A. canadensis* var. *rotundifolia*, Gray, Man. ed. 1, p. 130 (1848); also eds. 2–6. *A. canadensis* var. *spicata* Sarg., Silva iv. p. 129 (1892), in part. *A. spicata* Robinson & Fernald, Gray's Man. ed. 7, p. 460 (1908).

Straggling or arching slender shrub 1.0–2.5 m. high, not stoloniferous and not forming colonies, the stems solitary, or few in a clump: leaves oval to oval-oblong, rarely orbicular (blade 3–6 cm.  $\times$  2.5–4 cm.), rounded or subcordate at the base, apex subacute, margin coarsely dentate-serrate nearly or quite to the base with broad sharp spreading teeth (4–5 (6) teeth per cm., about 20–23 teeth on each side if toothed to the base) separated by acute, open sinuses; green above when young, rarely purplish, unfolding before the flowers, at first densely pale-flavescent-tomentose below, retaining some tomentum especially on the petioles, but often on the blade, till the fruit is half grown or rarely until maturity, at length pale green, slightly glaucous, and usually glabrous or nearly so; veins in an average leaf 13–15 pairs, rather close together, straight, conspicuous, all of the upper in typical specimens running straight to the margin and ending in the teeth (*Ulmus*-like), the uppermost strongly ascending; mature petioles slender, 12–22 mm. long: flowers many in a loose flexuous or drooping raceme (4–7 cm. long), slightly silky; lower pedicels (10) 12–30 mm. long, in fruit 12–25 (30) mm. long; flowers large and showy: petals linear to narrowly spatulate, 11–15 mm. long, 3–4 mm. wide: hypanthium rather large, open-saucer-shaped, 5 mm. in diameter,

glabrous outside or with a zone of hair at the base, constricted below on the young fruit and then very prominent: sepals ovate-lanceolate or lanceolate, very acute, 4 mm. long, revolute from the middle when the petals fall, glabrous without, hairy within: summit of the ovary densely woolly: fruit rather large, almost black, glaucous, very sweet, juicy and agreeable. Figs. 1 A-G.

A very beautiful species when well developed; the flowers appearing 10-14 days later than those of *A. canadensis* and *A. laevis*; the fruit maturing in August or September. On dry rocky or gravelly soil in calcareous districts; eastern, northern and central Maine, Vermont, western Massachusetts, Quebec, Ontario, Michigan, and possibly farther westward, south through New York along the mountains to northern Alabama.

Forma **grandiflora**, f. nov., floribus pergrandibus pulchrisque, petalis 17-20 mm. longis, 5-6 mm. latis.

Flowers very large and showy; petals 17-20 mm.  $\times$  5-6 mm. Overhanging the ravines of central New York. Type in Gray Herb.: Ithaca, N. Y. *Wiegand*.

Var. **gaspensis**, var. nov., glabra foliis novellis gemmisque exceptis; venis foliorum ad marginem valde reticulatis.

Glabrous, except the youngest leaves and flower buds: the veins of the leaves prominently anastomosing before reaching the teeth. Rocky banks and river gravel on the Gaspé Peninsula, Quebec. Type in Gray Herb.: alluvial woods, mouth of Bonaventure River, 1902. *Fernald & Williams*.

Britton, in describing the habit of this species in the Illustrated Flora says; "A tall shrub or small tree, sometimes 25° high"; and in the N. A. Trees he says: "Its maximum height is 6 meters, with a trunk diameter of about 3 dm." Blanchard (*Torrey*, vii. p. 100) in writing of what was probably this species, says: "It has large and nearly round leaves, generally coarsely toothed,—and is often quite large or a small tree." Michaux gives the habit "*arborescens*," which, from the context, means in size between a tree and a shrub. The writer is acquainted with this species in central New York, where it festoons the crests and the ledges of cliffs bordering lakes and ravines, and is usually flanked or backed by other bushes and trees. It always occurs, therefore, in slightly more humid situations than those frequented by *A. humilis*. There, in that locality, it is always a delicate, wand-like, arching shrub, never more than about 3 m. high and with a stem never over 3 cm. in diameter. Sometimes these stems are solitary, sometimes in groups of several, but never forming broad patches as in *A. humilis*, nor forming dense clumps as in *A. oblongifolia*. Nothing even remotely approaching a tree-like habit has ever been

reported in central New York. The writer has also been told by one who is familiar with this species in Maine, that the habit there is as described for central New York, and certainly not tree-like. Mr. Eggleston has informed the writer, personally, of a single tree-like individual of this species in Vermont. Such individual trees may be hybrids with one of the arborescent species.

The var. *gaspensis* is a perplexing form. It varies much in stature and in habitat, as well as in leaf-outline and dentation. The leaves suggest an intermediate condition between this species and *A. humilis*, especially in the venation. In its more glabrous nature it approaches *A. florida*; but the general appearance of the majority of the specimens, both when in flower and in fruit, suggests that it is better to retain this form in *A. sanguinea* until further field study renders it better understood. More field work on all the Amelanchiers of Gaspé is very desirable.

The following typical specimens have been examined. MAINE:—Washington Co. rocks, Pembroke, July, 1909, *Fernald & Wiegand* (*Fernald* no. 1880): Aroostook Co. rocky river bank, Masardis, September, 1897, June, 1898, *Fernald*, no. 2311; Houlton, ledgy shore, August, 1897, *Fernald*; gravelly river bank, Ashland, June, 1898, *Fernald*, no. 2310 (not typical): Piscataquis Co. cliff below the falls, Dover, August, 1895, *Fernald*, no. 388; rocky shore, Dover, 1896, *Geo. B. Fernald*, nos. 40 and 40f; calcareous slate ledges along river, Foxcroft, May and July, 1896, *Geo. B. Fernald*, nos. 53 and 53f; ledgy shore, Sangerville, July, 1897, *Fernald*: Somerset Co. Moose Brook, valley of Seabasticook River, 1873–78, *F. S. Bunker*: Penobscot Co. Orono, May, 1873, *F. L. Scribner*: Oxford Co. ledgy river bank, Gilead, 1897, *Kate Furbish*. VERMONT:—Essex Co. Canaan Falls, August, 1899, *W. W. Eggleston*, no. 1121: Addison Co. rocky bank along Otter Creek, Middlebury, May and July, 1901, *Brainerd*: Rutland Co. Bald Mt., Shrewsbury, May, 1900, *Eggleston*, no. 1970 (not typical): Windsor Co. rocky summit, Hawkes Mt., Cavendish, August, 1900, *Fernald*, no. 449. MASSACHUSETTS:—Franklin Co. calcareous slaty ledges by the Connecticut River near Miller's Falls, May, 1911, *Fernald*: Berkshire Co. summit of Tom Ball Mt., Alford, August, 1904, *R. Hoffmann*. NEW YORK:—Washington Co. rocks, Mt. Nebo west of Fort Ann, September, 1911, *S. H. Burnham*, no. 15: Tompkins Co. White Church, June, 1881, *W. R. Dudley*, no. 55; Ithaca, rocks, 1897, *K. M. Wiegand*. NORTH CAROLINA:—Buncombe Co. Craggy Mt., April & June, 1899, *Biltmore Herb.*, nos. 5664c and d; Cedar Cliff Mt., 1904, *Biltmore Herb.* ALABAMA:—Blount Co. "shrub," Sand Mt., June, 1901, *Biltmore Herb.*, no. 6706a. ONTARIO:—Brockville Co. rocky bank of St. Lawrence River, Brockville, October, 1907, *Blanchard*, set 6 (probably): Frontenac



Co., Plevna, August, 1902, *J. Fowler*: Simcoe Co. Gravehurst, August, 1897, *Biltmore Herb.*, no. 5664. MICHIGAN:—Huron Co. in poor and sandy ground in open woods, Sand Point, July, 1908, *C. K. Dodge*, Nos. 74, 76; Stony Island, Saginaw Bay, "plentiful in poor and sandy ground," July, 1908, *C. K. Dodge*, no. 75: Allegan Co. beach sand near Saugatuck, August, 1896, *C. F. Wheeler*. MINNESOTA:—Hennepin Co. Falls of Minnehaha, July, 1886, *L. H. Bailey*.

Forma GRANDIFLORA. NEW YORK:—Chenango Co. Norwich, May, 1892, *H. L. Stewart*: Tompkins Co. Fall Creek Ravine, Ithaca, May, 1882, *W. R. Dudley*, 1896, *K. M. Wiegand*; McKenney's Glens, Ithaca, 1899, *Wiegand*; Southwest corner of Cayuga Lake, Ithaca, 1899, *Wiegand*.

Var. GASPENSIS. QUEBEC:—Gaspé Co. thicket near mouth of River St. Anne des Monts, August, 1905, *Collins & Fernald*; rocky bank, Percé Mt., Percé, August, 1904, *Collins, Fernald & Pease*; banks of Grand River, July, 1903, *Geo. H. Richards*, July, 1904, *Fernald*: Matane Co. banks of Matane River 10 miles up stream, August, 1904, *F. F. Forbes*: Rimouski Co. dry ledges, Bic, July, 1904, *Collins & Fernald*: Bonaventure Co. alluvial woods, mouth of Bonaventure River, July, 1902, *Williams & Fernald*; gravelly beach and flats, Bonaventure River, August, 1904, *Collins, Fernald & Pease*.

## 2. *A. humilis* sp. nov.

*A. spicata* many Amer. authors, in part, probably; not *A. spicata* (Lam.) Koch, *Dendrol.* i. p. 182 (1869).

Frutex 3–12 dm. altus caespitosus substoloniferus; foliis ovali-oblongis ovalibus vel obovato-cuneatis basi subcordatis vel rotundatis apice obtusis margine grosse dentato-serratis, dentibus valde patentibus, junioribus subtus dense tomentosis, pilis pallide flavescentibus, demum glabratis subviridis, venis subevanescentibus, petiolis 8–20 mm. longis; racemis densis erectis tomentosis; petalis 7–10 mm. longis obovato-oblongis; hypanthio pelviformi post anthesem infra constricto; sepalis brevibus triangulari-lanceolatis vel -ovatis ab medio revolutis; ovario ad apicem dense lanato; fructu atropurpureo glauco.

A rather stiffly upright shrub, 3–12 dm. high, growing in patches from rhizome-like bases (stoloniferous), the individual stems scattered: leaves oval-oblong or less commonly oval, rarely obovate-cuneate (blade of average leaves 2.5–5 cm. long by 2–4 cm. broad), sub-cordate, rarely rounded at the base, broadly rounded to a low angle at the apex, rarely sub-acute or sub-truncate; margin coarsely dentate-serrate to below the middle, or in stunted plants to the middle only; teeth rather low, often double, ascending, abruptly short-apiculate from a blunt summit, sinus acute (4–5 teeth per cm., about 20 teeth on each side when toothed to the base); green above when

young, unfolding with the flowers, at first densely pale-flavescent-tomentose beneath, at length pale green and glabrous or nearly so except usually the petioles, and slightly glaucous; veins in average leaves 9-13 pairs, conspicuous, ascending, the upper especially so, close together, slightly more arching and slightly less regular than in *A. sanguinea*, mostly forking and becoming indistinct before reaching the margin; mature petioles 8-20 mm. long; flowers small and numerous in rather dense terminal and lateral upright racemes (about 4-5 cm. long); pedicels and axis silky-tomentose, lower pedicels 8-17 mm. long, in fruit 10-20 (25) mm. long; petals obovate-oblong, broad for the length (7-10 mm. by 4-5 mm.), broadest just above the middle; hypanthium saucer-shaped, about 4 mm. in diameter, constricted below on the young fruit and then quite prominent, tomentose outside or becoming glabrate toward the summit; sepals short, triangular-lanceolate or ovate, 2-4 mm. long, revolute from the middle when the petals fall, usually hairy on both sides; ovary densely woolly at the summit; fruit almost black, glaucous, sweet, juicy and agreeable. FIGS. 2 A-G.

Flowers appearing with those of *A. sanguinea*, about 10-14 days later than *A. canadensis*; fruit maturing in August. Dry open rocky or gravelly soil in calcareous districts; Vermont and Ontario to New York, Ohio, Nebraska, and Minnesota, and apparently northwestward to Mackenzie.

This species differs from *A. sanguinea* in its low stature, stoloniferous growth, blunter leaves, lower, blunter and more ascending teeth, less straight and less parallel veins which do not run directly to the teeth, upright dense woolly racemes, smaller flowers on shorter pedicels with shorter and broader sepals and petals, and slightly deeper, narrower hypanthium. The hypanthium of *A. sanguinea* is almost rotate, while that of *A. humilis* is deeply saucer-shaped.

*A. humilis* is always low, and, so far as the writer can learn, always has the peculiar "stoloniferous" habit above described. The roots or stems just at the surface of the ground or slightly below extend horizontally a short distance in a very irregular fashion and then send up strictly erect branched aerial shoots. The result is a "patch" of plants often covering a square meter or more with the aerial stems equally distributed over that area. The writer is acquainted with this species on the shores of Cayuga Lake in Central New York, where it forms patches on the crests of the driest calcareous cliffs along the lake, and where it is exposed to full sunlight. Writing of this species, presumably, Mr. Herbert Groh<sup>1</sup> says: "Each patch is some square

<sup>1</sup> Ont. Nat. Sci. Bull. (No. 6, p. 52, 1910.)

rods in extent, like a thicket of raspberries or osier-dogwood, and the closely crowded stems composing it are only from one to three feet in height, and when found were flowering profusely, regardless of size."

Occasionally, both in Vermont and at Ithaca, N. Y., individual plants occur with obovate-cuneate leaves dentate near the apex only, but in other respects typical. These seem like mere individual variations from the normal type.

The following typical specimens have been examined. VERMONT:—Lake Champlain, limestone headlands, Cloak Island, Isle la Motte, June, 1907, *J. A. Cushman*, no. 871 (probably); dry banks of Grand Isle, *Robbins*, *Oakes* (probably). NEW YORK:—Rensselaer Co. Lansingburg, *C. H. Peck*; Troy, *H. H. Eaton*: Orange Co. West Point, May, 1882, *Ella W. Meams* (probably): Tompkins Co. exposed rocks, shore of Cayuga Lake, Ithaca, 1896, *Wiegand*. ONTARIO:—Near Mt. Dennis, June, 1900, *D. W. Beadle*; Hastings Co., Belleville, 1878, *Macoun*; vicinity of Ottawa, July 1906, *Rydberg*, no. 7912. OHIO:—Franklin Co. Columbus, *Sullivant* (?). MICHIGAN:—Kent Co. very barren sand, June, 1897, *C. W. Fallass*. WISCONSIN:—1882, *J. Dunlop*: Dame Co. 1861, *T. J. Hale*. IOWA:—Floyd Co. Charles City, May, 1875, *J. C. Arthur*: Fayette Co., 1894, *B. Fink*. MINNESOTA:—Houston Co. Spring Grove, June, 1902, *C. O. Rosendahl*, no. 316. NEBRASKA:—Cherry Co. Valentine, May, 1898, *Bates*; Simeon, July, 1899, *Bates*; Merriman, 1898, *Bates*: Dawes Co. Fort Robinson, May, 1897, *Bates*: Greeley Co. Scotia Junction, *Bates*: Rock Co. Kirkwood, *Bates*: Brown Co. Johnstown, *Bates*. ALBERTA:—vicinity of Banff, June, 1906, *Stewardson Brown*, nos. 23 & 56 (not typical). ATHABASCA:—Athabasca River, 1892, *Miss E. Taylor* (probably this sp.). MACKENZIE:—Fort Resolution, 1903, *E. A. Preble*, no. 202 (probably this sp.).

### 3. A. FLORIDA Lindley.

*Aronia alnifolia* Nutt., Gen. Am. i. p. 306 (1818), possibly: *Amelanchier florida* Lindley, Bot. Reg. t. 1589 (1833): *Am. alnifolia*, many Am. authors.

Shrub 0.5–3 m. high: leaves broadly oval or short-oblong-oval (blade of average leaf 3–4 cm. × 2.5–3.3 cm.); base subtruncate, rarely rounded or subcordate; apex rounded, subtruncate, or rarely retuse; margin coarsely and sharply toothed, usually to the middle or rarely below, with few, spreading, deltoid, obliquely acute teeth (3–5 teeth per cm.), and acute open sinuses; green above when young, fully unfolded but not full grown at flowering time, tomentose at first but very soon entirely glabrous (usually before the flowers are fully expanded); veins about 12 pairs, rather conspicuous, parallel, close

together, the upper strongly ascending, all slightly irregular and not running straight to the margin; mature petioles 15–20 mm. long: racemes many flowered, mostly lateral, short, dense, erect, glabrous, 3–5 cm. long; lower pedicels 8–17 mm. long, in fruit 10–25 mm. long: flowers small or of medium size: petals from oblong to narrowly oblong, 7–15 mm. long: hypanthium open saucer-shaped, very rarely slightly woolly, 3–4 mm. in diameter, constricted below on the young fruit: sepals short, triangular or lanceolate, 1.5–2.5 mm. long, recurved from the middle when the petals fall, slightly woolly inside: summit of the ovary woolly, becoming almost glabrate in fruit: mature fruit almost black, glaucous. FIGS. 3 A–G.

Related to *A. sanguinea* in its narrow and often long petals, but differing in the blunter leaves with veins which do not reach the margin, fewer teeth of a different shape, shorter erect racemes with the flowers on shorter pedicels, and the more glabrous character of the whole plant. Closely related to *A. humilis* in the venation of the leaves and in general appearance, but differing in narrower, often longer, petals, blunter leaves, usually sharper teeth, and much earlier loss of tomentum.

The following typical specimens from the area covered by this paper have been examined. MICHIGAN:—Houghton Co. Isle Royale, July, 1909, *W. S. Cooper*, no. 122: Keweenaw Co. on bluffs, May & July, 1889, *O. A. Farwell*: Alcona Co. Plains, June, 1888, *L. H. Bailey*.

#### 4. *A. stolonifera* sp. nov.

*A. spicata* Brit. & Brown, Ill. Fl. ii. p. 238 (1897), in part; Brit. Man. p. 517 (1901) in part; many Europ. auth. in part: not *A. spicata* (Lam.) Koch, Dendrol. i. p. 182 (1869). *A. ovalis* of many Europ. auth. in part; not *Pyrus ovalis* Willd., Berlin Baumz., ed. 1, p. 259 (1796); not *A. ovalis* Medic. Gesch. p. 79 (1793): not *A. ovalis* Borkh., Fortb. ii. p. 1259 (1803). *A. oblongifolia* Robinson & Fernald, Gray's Man. ed. 7, p. 460 (1908), in part.

Frutex 3–12 dm. altus substoloniferus caespitosus; foliis ovalis raro oblongo-ovalibus orbicularibus vel obovato-cuneatis apice fere rotundatis mucronatis basi fere rotundatis raro subcordatis vel cuneatis margine subtiliter serratis, junioribus subtus albo-tomentosis demum undique glabris vel glabratis, venis primariis 7–11 jugis irregularibus arcuato-ascendentibus evanescentibus; racemis brevibus densis erectis sericeo-tomentosis; petalis 7–9 mm. longis; hypanthio pelviformo post anthesem infra constricto conspicuo; sepalis revolutis; ovario ad apicem tomentoso; fructu atropurpureo vel nigro glauco.

A rather stiff upright shrub, 3–12 dm. high, forming patches ("stoloniferous") as in *A. humilis*: leaves commonly oval, rarely oblong-

oval or orbicular, very rarely obovate-cuneate (average blades 2.5–5 cm.  $\times$  2–3.5 cm.); apex rounded or sub-acute, mucronate; base rounded, rarely subcordate with a small narrow sinus, rarely cuneate; margin finely serrate with low obliquely-mucronate teeth, almost or quite entire on the lower third (5–8 teeth per cm.; 20–28, rarely 30–32, teeth on each side if toothed to the base), and acute or rounded, open sinuses; green and glabrous above when young, densely white-tomentose beneath, soon glabrous throughout or the petioles and midribs often remaining slightly hairy; about half grown at flowering time and then just unfolding, at maturity usually pale green and glaucous, sometimes deep green; primary veins, in average leaves, 7–11 (mostly 8–9) pairs, irregularly and distantly arranged, usually curved upward beyond the middle and becoming very irregular and indistinct before reaching the margin; mature petioles slender, 10–18 mm. long: racemes short, dense, erect, 1.5–4 cm. long; pedicels and axis silky tomentose or almost glabrous, the lower pedicels 7–15 mm. long, in fruit 12–22 mm. long: flowers small: petals obovate-oblong, broad for the length, 7–9 mm. long: hypanthium open, saucer-shaped, about 3–4 mm. in diameter, tomentose at the base or nearly glabrous, constricted below on the young fruit and then very prominent: sepals triangular-lanceolate, 2.5–3 mm. long, revolute from the middle when the petals fall, inner face tomentose: summit of the ovary densely woolly: fruit purplish black, glaucous, sweet, juicy and of good flavor. FIGS. 4 A–G.

Flowers appearing a few days later than those of *A. oblongifolia* and *A. laevis*; fruit maturing in July. On dry rocks, gravel, or rarely in sand, in non-calcareous districts on the coastal plain; in Newfoundland, and from Maine to Virginia. It accompanies the coastal plain flora up the rivers, and extends to the non-calcareous summits of mountains in Vermont and western Massachusetts, as well as to the sandy region about Albany, New York, and Lake George, and apparently also to the shores of Lake Huron and Lake Erie. Type specimen in Gray Herb.—Sandy R. R. bank, Wellesley, Mass., May–June, 1911, *Wiegand*.

This species has the same habit as *A. humilis*, and takes the place of that plant on the coastal plain. In floral structure there is very little difference between the two, but the foliage of the present species is much more closely related to that of *A. oblongifolia*, from which it differs in the shorter outline of the leaf, fewer veins, and slightly coarser teeth. It is similar to *A. sanguinea*, *A. humilis*, *A. florida*, and *A. Bartramiana* in the conspicuous constricted hypanthium on the half grown fruit. The remaining four species are without this character.

The following typical specimens have been examined. NEW-FOUNDLAND:—Grand Falls, rocks and talus, gorge of the Exploits

River, July & August, 1911, *Fernald & Wiegand*, nos. 5557, 5558, 5559, 5561, 5562, 5563, 5608, 5623, 5633; Rushy Pond, gravelly and rocky pond shore, July & August, 1911, *Fernald & Wiegand*, nos. 5627, 5630, 5635. MAINE:—Washington Co. dry roadside thicket, West Pembroke, July, 1909, *Fernald & Wiegand* (*Fernald*, no. 1887): Hancock Co., Orland, *Helen G. Atkins*: Penobscot Co. river bank, Roebur's, July, 1900, *Fernald*; ledgy shore, Oldtown, September, 1897, *Fernald*; ledgy shore, Orono, July, 1892 and 1897, *Fernald*: Piscataquis Co., granite ledges, top of Bunker Mountain, East Guilford, May, 1896, *Geo. B. Fernald*, no. 39: Franklin Co. Phillips, September, 1894, *Furbish*; crevice of rocks, Bald Mt., July, 1902, *E. B. Chamberlain*: Kennebec Co. ledgy river bank, Waterville, June, 1874, *F. L. Scribner*, September, 1898, *Fernald*; Kent's Hill, Readfield, 1892, *Furbish*: Androscoggin Co. South Poland, 1893 and 1895, *Furbish*; East Livermore, 1894, *Furbish*; Livermore Falls, 1878, *Furbish*; Bear Mt., Livermore, 1896, *Furbish*: Oxford Co. low bushes on ledgy bank, Gilead, August, 1897, *Furbish*: Lincoln Co. roadside, Bristol, July, 1903, *J. R. Churchill*: Sagadahoc Co. West Bath, 1892, *Furbish*: Cumberland Co. West Baldwin, 1900, *Furbish*; Brunswick, 1892, *Furbish*: York Co. Wells, 1898, *Furbish*; rocky woods, York, June, 1900, *Fernald*; Shapleigh, June, 1901, *Furbish*. NEW HAMPSHIRE:—N. H., *H. E. Sargent*, no. 25: Cheshire Co. ledgy river bank, Walpole, July, 1899, *Fernald*. VERMONT:—Chittenden Co. Essex Junction, August, 1899, *Eggleston*, no. 1176: Addison Co. cliffs, Snake Mt., Weybridge, May, 1899, *E. Brainerd*: Rutland Co. Twin Mt., May, 1898, *Eggleston*, no. 185 (probably this sp.). MASSACHUSETTS:—Essex Co. East Gloucester, May, 1899, *J. H. Sears*: Middlesex Co., Middlesex Fells, May, 1881, *F. S. Collins*; Stoneham, South Reservoir, July, 1894, *W. P. Rich*; Natick, dry upland woods, Pickerel Pond, 1909, *Wiegand*: Norfolk Co. summit of Great Blue Hill, ledges, May, 1899, *Kennedy & Fernald*, ledges, north side, June, 1900, *W. P. Rich*, 1900, *E. F. Williams*, 1901 and 1902, *F. G. Floyd*; Wellesley, dry banks, 1908, *Wiegand*, and sandy railroad bank, 1911, *Wiegand*: Nantucket Co. June, 1900, *M. A. Day*, no. 75: Franklin Co. sand plains, Miller's Falls, Montague, May, 1911, *Fernald*: Berkshire Co. the Dome near summit, Sheffield, August, 1902, *R. Hoffmann*. CONNECTICUT:—New London Co. moist ground near Stillman's Cove, Waterford, May and June, 1901, *C. B. Graves*: Hartford Co. dry sandy bank, East Hartford, May & September, 1906, *C. A. Weatherby*, no. 2018; Southington, rocky or sandy roadside, 1900, 1901, *C. H. Bissell*. NEW YORK:—Washington Co. sandy plains north of Sandy Hill, August, 1900, *S. H. Burnham*; rocks east of Fort Ann, May, 1900, *Burnham*: Warren Co. rocks in Hudson River, Glens Falls, May & September, 1900, *Burnham*, no. 13: Suffolk Co. dry pine barrens south of Ronkonkoma, July, 1908, *R. M. Harper*: New York Co., Cactus Knoll, New York City, June, 1899, *W. N. Clute*. NEW JERSEY:—N. J., 1840, *Asa Gray*: Sussex Co.

Culvers Gap, summit of west side, July, 1907, S. S. Van Pelt; High Point, 1891, N. L. Britton; high rocky hill, High Point, July, 1909, K. K. Mackenzie, no. 4201: Passaic Co. rocky headlands, Charlotteburg, May, 1908, K. K. Mackenzie: Bergen Co. Palisades, 1890, Bicknell: Union Co. (?), Great Island near Elizabethport, July, 1890 (not typical): Monmouth Co. margin of woods, July, 1910, S. Brown & B. Long, no. 168. PENNSYLVANIA:—Luzerne Co. L. V. R. R. between Moosehead and Bear Creek Junct., July, 1901, S. Brown: Monroe Co. base of Pocono Knob, July, 1896, J. Crawford; near Tannersville, July, 1901, S. Brown: Northampton Co. on the Delaware River above Easton, May, 1897, T. C. Porter: Bucks Co. Naseville, May 1897, A. Jahn: Chester Co. Phoenixville, July, 1863, I. C. Martindale. MARYLAND:—Montgomery Co. rocks, Great Falls of the Potomac, 1895, F. V. Coville, no. 166, Pollard, no. 166; May, 1899 E. S. Steele. VIRGINIA:—Princess Co. near Virginia Beach, 1898, Coville & Kearney, no. 51 (not typical): Nansemond Co. near Suffolk, 1898, Kearney (not typical). NORTH CAROLINA:—Buncombe Co. banks of French Broad River, June, 1898, Biltmore Herbarium, no. 6706 (not typical). MICHIGAN:—Alpena Co. on sterile "plains" near Alpena, July, 1895, C. F. Wheeler.

##### 5. *A. OBLONGIFOLIA* (T. & G.) Roemer.

*Mespilus canadensis*  $\alpha$  *obovalis* Michx., Fl. Bor. Am. p. 291 (1803) (?); Sarg., Silva, iv. p. 128 (1892), in part. *M. arborea* Michx., Hist. Arb. Am. Sept. iii. p. 68 (1810), in small part. *Pyrus ovalis* Bigel., Fl. Bost. ed. 2, p. 195 (1824); Pursh, Fl. Am. Sept. p. 340 (1814): not *P. ovalis* Willd., Berl. Baumz. p. 259 (1796); nor *A. ovalis* Medic. Gesch. p. 79 (1793): nor *A. ovalis* Borkh, Forstb. ii. p. 1259 (1803). *Aronia ovalis* Torr., Fl. N. U. S. p. 479 (1824). *Am. canadensis*  $\beta$  *oblongifolia* T. & G., Fl. N. A. i. p. 473 (1840); Torr., Fl. N. Y. p. 225 (1843); Gray, Man. ed. 1, p. 130 (1848); ed. 2, in part; ed. 6, in part. *A. oblongifolia* Roem., Fam. Nat. Syst. Rosifl. p. 147 (1847); Robinson & Fernald, Gray's Man. ed. 7, p. 460 (1908), in part; *A. Botryapium* Brit. & Brown, Ill. Flora ii. p. 238 (1897), in part; Brit., Man. p. 517 (1901), in part. *A. obovalis* Ashe, Bot. Gaz. xxxv. p. 434 (1903); Sarg., Trees N. A. p. 361 (1905), in part. *A. intermedia* Blanchard, Torrey, vii. p. 98 (1907), in part; Brit., N. A. Trees, p. 438 (1908), in part; not *A. intermedia* Spach, Hist. Veg. Phan., ii. p. 85 (1834).

Shrub with the slender upright stems growing in rather dense fastigiate clumps (cespitose, alder-like), 2–8 m. high, not stoloniferous: leaves oblong elliptic-oblong or narrowly obovate-oblong (average blades 3–5.5 cm.  $\times$  1.8–2.8 cm.); apex rounded or barely acute, mucronate or cuspidate; base rounded, rarely subcordate with a minute sinus, rarely subacute; margin very finely serrate with low sharp teeth nearly or quite to the base (6–11, av. 8–9, teeth per cm.,

or fewer on leaders; 20–45, mostly 25–40, teeth on each side on average leaves) and acute but open sinuses; when young densely white tomentose beneath, nearly glabrous above, less than half grown at flowering time and still unfolded, at maturity usually deep green, rarely glaucous, glabrous except petiole and lower portion of midrib, the latter prominent; primary veins in average leaves 10–15 (mostly 11–13) pairs, somewhat irregular, rather close together, slightly upcurved toward the margin, becoming indistinct and anastomosing in the outer third, uppermost veins widely spreading; mature petioles 8–15 mm. long; racemes short, dense, upright, terminal and many lateral, 2.5–6 cm. long; pedicels and axis silky-tomentose, lower pedicels 8–18 mm. long, scarcely longer in fruit (10–22 mm. long): flowers rather small: petals from obovate-oblong to oblanceolate or linear, 7–9 (10) mm. long, usually narrower than in *A. stolonifera*: hypanthium campanulate, 3–5 mm. in diameter, tomentose at the base or all over, on young fruit still campanulate and not conspicuously constricted: sepals tomentose within, triangular, acute, 1.5–2.5 (3) mm. long, erect or irregularly spreading: summit of the ovary glabrous or very rarely somewhat woolly: fruit nearly black, glaucous, moderately sweet and agreeable. FIGS. 5 A–H.

Flowers appearing early with those of *A. laevis*; fruit ripe in June. Non-calcareous swamps or low grounds in the coastal plain from southern Maine to South Carolina and possibly Georgia.<sup>1</sup>

This is a very characteristic plant along the coast. In Massachusetts and Connecticut, where it is quite common, the bushy habit enables one to recognize it at a distance when it is in flower, since the peculiar alder-like habit is quite characteristic. The calyx and hypanthium of this species represent a distinct type, since it is the only species, except possibly *A. Bartramiana*, in which the sepals do not normally turn back in some fashion. About Boston, where the writer has observed this plant for several seasons, the short *stubby* sepals are quite generally erect, or only irregularly spreading, even until the fruit is mature. This species, too, is the only one in which the lanation of the summit of the ovary varies greatly, and all gradations from a completely glabrous condition, which seems most common, to a sparsely lanate covering may occasionally be found. All other characters, however, remain fairly constant. At present, there is no good reason to believe that this variation in the woolly covering of the ovary is due to hybridization.

<sup>1</sup> Ashe says of his *A. obovalis*, which seems to be this species: — "This plant is not uncommon along the edges of swamps on loose soils from Smithfield, N. C., southward along the coast to Augusta, Ga., and according to Sargent to Mobile, Ala." The writer has not seen plants from so far south.



As the fruit matures the inflorescence expands much less in this species than in others, the axis and pedicels remaining short. The shoots upon which the racemes are borne remain short also, while frequently there is a strong growth of leafy shoot beyond the inflorescence and as a result the inflorescence often appears to have been left far behind, and to have been lateral when really terminal after the manner of *Stellaria uliginosa*. Unfortunately this condition is too frequently obscure to be of use as a distinguishing characteristic.

At Ithaca, New York, and at Freeville, ten miles away, a very anomalous condition exists in respect to *A. oblongifolia*. Several plants have been found by the writer in low or boggy ground, which have the exact habit of this species and which appear like it when in flower, but which have a more acute leaf than *A. oblongifolia* with fewer veins and fewer sharper teeth as well as a slight tendency toward purple coloration when young. The largest and finest of these plants are found in a boggy spot noted already as an extreme inland station for several coastal plain species, among which is *Lyonia ligustrina*. A satisfactory disposition of these plants cannot be made until the region is thoroughly searched to see if the typical *A. oblongifolia* may not be discovered. If such a discovery should be made these anomalous plants may be reasonably interpreted as hybrids between *A. oblongifolia* and *A. laevis*.

The following typical specimens have been examined. MAINE:—Kennebec Co. Fryette, 1878, *K. Furbish*: Oxford Co. Gilead, 1897, *Furbish*: Cumberland Co. West Baldwin, September, 1900, *Furbish*: York Co. Wells 1897, 1898, *Furbish*. MASSACHUSETTS:—Essex Co., Ipswich, *Oakes*; East Gloucester, July, 1891, *J. H. Sears*: Middlesex Co. Lincoln, May, 1906, *Fernald*; Spot Pond, Stoneham, May, 1854, *Wm. Boott*; Fresh Pond swamps, Cambridge, 1855, *Wm. Boott*: Suffolk Co. Roxbury, 1835, *Wm. Boott*: Suffolk or Norfolk Cos. Stony Brook Reservation, June, 1895, *P. Gallagher*, June, 1895, *W. M. Manning*: Norfolk Co. swamps, Wellesley, 1908, *K. M. Wiegand*; Blue Hill, wet place near observatory, 1911, *Wiegand*; Holbrook, June, 1899, *E. F. Williams*: Barnstable Co. Hyannisport, July, 1896, *J. R. Churchill*. CONNECTICUT:—New London Co. moist ground near Silliman's Cove, and low ground near south end of Fargo Road, Waterford, May & July, 1901, *C. B. Graves*: Hartford Co. "roadside in sandy soil," and "beside brook," and "roadside in wet hard soil," Southington, May & June, 1901, *C. H. Bissell*: New Haven Co. damp woods, Oxford, May & June, 1901, *E. B. Harger*: Fairfield Co. wet woods, Bridgeport, May, 1901, *E. H. Eames*. NEW YORK:—Richmond Co. in swamp, Annadale, May & August,

1892, *N. L. Britton*: Tompkins Co. (probably this sp.). NEW JERSEY: — Passaic Co. Manchester, 1877, *A. Brown*: Monmouth Co., Farmingdale, May 1910, *B. Long & S. Brown*, no. 3600: Ocean Co. Forked River, 1896, Exc. Torr. Bot. Club: Burlington Co. Brown's Mills, April, 1905, *A. MacElwee*: Camden Co. (?) Westville, May, 1894, *A. MacElwee*: Atlantic Co. Landisville, June, 1899, *C. A. Gross* Herb.; Folsom, June, 1911, *B. Long*, no. 5918; Newtonville, June, 1911, *B. Long*, no. 5915. PENNSYLVANIA: — Delaware Co. Preston Run, June, 1904, *A. Jahn*: Lancaster Co. 1900, *Heller*; vicinity of Smithville, May, 1890, *J. K. Small*. DISTRICT OF COLUMBIA: — Vicinity of Washington, 1880, *L. F. Ward*. VIRGINIA: — Norfolk Co. Great Bridge, May, 1893, *Britton & Small*; near Northwest, 1898, *Kearney*, no. 1100: Princess Ann Co. 1898, *Kearney*, no. 1125. NORTH CAROLINA: — South East N. C., *W. W. Ashe*: Cumberland Co. Fayetteville, 1895, *A. Bradford*. SOUTH CAROLINA: — Darlington Co. "ditch across creek at Paper Mill," Hartsville, 1909, *W. S. Coker* (probably this sp.).

#### 6. A. CANADENSIS (L.) Medicus.

*Mespilus canadensis* L. Sp. Pl. p. 478 (1753). *Pyrus Botryapium* L. f. Suppl. p. 255 (1781); Willd. Sp. Pl. ii. p. 1013 (1799); Pursh Fl. Am. Sept. p. 339 (1814). *Crataegus racemosa* Lamk. Encyc. i. p. 84 (1783) (?). *Mespilus nivea* Marsh. Arbust. p. 90 (1785) (?). *A. canadensis* Medic. Gesch. p. 79 (1793). *Crataegus amoena* Salisb. Prod. p. 357 (1796). *Mespilus canadensis*  $\beta$  *cordata* Michx. Fl. Bor. Am. p. 291 (1803). *A. Botryapium* Borkh. Handb. Forstb. ii. p. 1260 (1803) (?); DC. Prod. ii. p. 632 (1825); Hook, Fl. Bor. Am. i. p. 202 (1840) (?); Brit. & Brown, Ill. Fl. ii, p. 238 (1897), in part; Brit. Man. p. 517 (1901), in part; Small Fl. Se. U. S. p. 531 (1903), in part. *Aronia Botryapium* Pers. Syn. ii. p. 39 (1807); Torr. Fl. N. & M. U. S. I. p. 479 (1824). *Mespilus arborea* Michx. Hist. Arb. Am. Sept. iii. p. 68 (1810). *Aronia arborea* Barton, Comp. Fl. Phil. i. p. 228 (1818). *Am. ovalis*  $\beta$  *subcordata* DC. Prod. ii. p. 632 (1825) (probably this sp.). *Aronia subcordata* Raf. ex. DC. Prod. ii. p. 632 (1825) (?). *Am. canadensis*  $\alpha$  *Botryapium* T. & G. Fl. N. A. p. 473 (1840); Torr. Fl. N. Y. p. 225 (1843); Gray, Man. ed. 1, p. 130 (1848) (?); Robinson & Fernald in Gray's Man. ed. 7, p. 460 (1908). *A. canadensis* var. (?) *oblongifolia*, Gray's Man. ed. 2, p. 126 (1856), in part; Man. ed. 6, p. 167 (1889), in part. *A. canadensis* var. *obovalis* Sarg. Silva iv. p. 128 (1892) in part. *A. canadensis* var. *tomentula* Sarg. Trees N. A. p. 361 (1905); Robinson & Fernald, RHODORA xi. p. 47 (1909). *A. intermedia* Brit. N. A. Trees, p. 438 (1908) in part; not Spach, Hist. Veg. Phan. ii. p. 85 (1834).

Irregularly bushy tree, 5-10 m. high, or sometimes a shrub, fastigiately and irregularly branched above; stems solitary or few

together: leaves generally obovate, less commonly ovate, oval or oblong (average blades 4–10 cm. long by 2.2–5 cm. wide); base cordate, or very rarely rounded or subacute on individual leaves near the ends of shoots; apex very acute, or more commonly acuminate; margin very sharply and somewhat doubly serrate almost or quite to the base, with medium ovate-triangular acuminate teeth separated by usually acute rather deep sinuses (6–10 teeth per cm.; (38) 45–75, mostly 50–60 teeth, on each side of average leaves); blades and petioles densely white tomentose below when young, less so above, traces of tomentum usually persistent, especially on the petioles, until maturity or even until old age, becoming green, not purple, very small at flowering time and not unfolded, or even entirely enclosed within the bud-scales; at maturity green or yellowish green, scarcely glaucous; primary veins in average leaves 11–17 pairs, often with short intermediate ones, unequally distant, sinuous, anastomosing and indistinct in the outer third, the uppermost very irregular, widely spreading; mature petioles 10–25 mm. long: racemes short, rather dense, nodding, 3–5 cm. long; lower pedicels 8–17 mm. long, becoming 15–25 mm. long in fruit, silky tomentose: flowers of medium size: petals linear or linear-oblong, 10–14 mm. long: hypanthium small, 2.5–3 (rarely 3.5) mm. in diameter, campanulate, glabrous or somewhat woolly, soon stretched around the summit of the ovary after flowering, and not constricted below: sepals broadly oblong-triangular, abruptly pointed or obtuse, rarely more slender, tomentose, 2–3 mm. long, abruptly reflexed at the base when the petals fall: summit of ovary glabrous: fruit scanty, maroon-purple, dry and tasteless. FIGS. 6 A–G.

Flowers appearing very early in spring before the leaves, or with the leaves in the more shrubby forms; fruit ripening in June. Dry banks and hillsides, Washington County, Maine, and from western New Hampshire to Iowa, Kansas and Missouri, and southward to Georgia and Louisiana.

The broad sepals and small hypanthium are usually quite characteristic of this species, but both vary to some extent. It is also the only species with leaves distinctly tomentose on both surfaces when young. It is distinguished from *A. laevis* by the tomentose inflorescence and leaves, the size of the hypanthium, shape of the sepals, number of veins in the leaves, and the number and shape of the teeth. From *A. oblongifolia* it differs in habit, in length of petals, size of hypanthium, shape and position of the sepals as well as the shape of the leaf, and its apex. The teeth are sharper and larger than in *A. oblongifolia*, with deep sharp sinuses. In the Southwest, the sinuses, however, are frequently shallower and not so acute, and the hypanthium is often larger. The tomentum is more persistent than in any of the other species.

This is the most abundant species in central New York and probably the most abundant from Ontario southward and southwestward; but is unknown in eastern New England except at Pembroke, Maine. This isolated station at Pembroke is, however, not unique, since several other plants were found in the same locality which showed a similarly interrupted distribution. These other plants were calciphiles, which fact suggests that the occurrence of *A. canadensis* at Pembroke is due to a local outcrop of lime. Michaux,<sup>1</sup> in his description of *Mespilus arborea* (which is probably a synonym of *A. canadensis*), may have confused this species with others when he said: "With the exception of the maritime parts of the Carolinas and of Georgia, this tree is spread over the whole extent of the United States and of Canada; but it is most multiplied upon the Alleghany Mountains, and upon the elevated banks of the rivers which flow from them."

This species comes into full bloom before the leaves are conspicuous in the spring, and while they are still completely covered with white wool. The flowers are usually very abundant and the plant, therefore, presents a beautiful snowy-white appearance with no intermixture of green or purple. As the common conspicuous snowy-white shad-bush of the landscape, it replaces inland the *A. oblongifolia* of the coastal plain.

According to the experience of the writer in central New York, *A. canadensis* does not produce fruit which will at all compare in edible qualities with that produced by other species, and he has never seen it of the same blue-black color as in other species. The pulp, too, is usually comparatively dry and tasteless. Michaux says (of *Mespilus arborea*), "... largest tree rarely yields more than half a pound . . . The fruit of this tree is, in my opinion, too small and too scanty to reward the pains of improving its taste and of increasing its volume by long continued cultivation." On the contrary, Curtiss<sup>2</sup> says: "In the latter [Lower District] section of the State [North Carolina], it is hardly more than a shrub, and is common along branches and swamps (*A. oblongifolia* . . . ? . . . auct.). In the former [Upper D.], it inhabits the shaded sides of Mountains, and is 15 to 25 feet high. The fruit is here much sweeter, more juicy and palatable, like the *Medlar*, than in other parts of the State, and the trees are some-

<sup>1</sup> N. A. Sylva (Transl.) ii. p. 41 (1853).

<sup>2</sup> M. A. Curtis, Trees of N. C. p 68 (1860).

times recklessly cut down to obtain it." Whether this difference of opinion is due to a confusion of *A. canadensis*, *A. laevis*, and *A. oblongifolia* is an interesting question. Wangenheim<sup>1</sup> in writing of *Pyrus Botryapium* in "New York Province," says of the fruit (translated): "The dark-carmine-red round-oval fruit is ripe toward the end of June — the flesh that surrounds these [seeds] is whitish, of sour taste, and serves only for the food of birds." His *P. Botryapium* was described as hairy when young, and was probably, in the main, *A. canadensis*.

The relation of the arborescent and shrubby forms of this species is perplexing. In Central New York the writer has found the arborescent form more common in the open, and the small shrubby form more common in the woods or on cliffs. The more tree-like plants frequently have a very short trunk, or if the trunk is longer, it is irregular and the branches are frequently turned more to one side, so that the transition to the smaller plants is not as abrupt as would at first appear. The two, obviously intergrade. The shrubby individuals, which may have several stems from the base, suggest *A. oblongifolia*, but the tops are bushy and spreading, thus giving a more umbrella-type of growth than the fastigate habit of *A. oblongifolia*. The leaves on the shrubby form are usually more or less unfolded at the time of flowering, while on most of the trees they have scarcely emerged from the bud-scales when the tree is in full bloom. These forms are probably ecological.

The following typical specimens have been examined. MAINE:—Washington Co. rocky woods, West Pembroke, July, 1909, *Fernald & Wiegand* (*Fernald*, no. 1885). NEW HAMPSHIRE:—Sullivan Co. Sumner's Falls, Plainfield, July, 1900, *Eggleston*, no. 1959. VERMONT:—Rutland Co. Noyes Swamp, Pittsford, May, 1899, *Eggleston*, no. 1183; Twin Mountain, West Rutland, July, 1900, *Eggleston*. MASSACHUSETTS:—Franklin Co. sandy thicket near Miller's Falls, May, 1911, *Fernald*. CONNECTICUT:—New Haven Co. Middlebury, April & July, 1896, *W. M. Shepardson*. ONTARIO:—Shore of Lake Ontario, Canada, 1891, *J. Dearners*; Welland Co. Niagara, May, 1901, *J. Macoun*, no. 34296. NEW YORK:—Tompkins Co. dry banks, Ithaca, 1873 & 1882 *Dudley*, 1896 *Wiegand*. PENNSYLVANIA:—Lehigh Co. June, 1878, *A. F. K. Krout*; 1911 *H. W. Pretz*, nos. 3188, 3251, 3403; Monroe Co. August, 1911, *Bayard Long*, no. 6586; Philadelphia Co., June, 1908, *S. S. VanPelt*; Pike Co., Blooming Grove, May, 1891, *Anna M. Vail*; Alleghany Co. Harrison Township, 1893, *A. Koenig*. WEST VIRGINIA:—Upshur Co. Bucklin, 1895,

<sup>1</sup> Beitrag z. deutsch. Forstwiss.; Anpf. Nordam. Holza. p. 90 (1787).

*W. M. Pollock*. DISTRICT OF COLUMBIA:—Anatoslian Island, April, 1881, *L. M. Ward*. VIRGINIA:—Norfolk Co., near Norfolk, 1898, *Kearney*, no. 1173: Pulaski Co. on Peak Mountain, alt. 2200 ft., July, 1892, *J. K. Small*: Smyth Co. Pond Mountain, and Marion, May, July, 1892, *N. L. Britton*, *E. G. Britton & A. M. Vail*: Wash. Co. White Top Mt., Aug. 1892, *Small*. NORTH CAROLINA:—Henderson Co. woodland near Flatrock, June, 1904, *Biltmore Herbarium*, no. 5615 f. SOUTH CAROLINA:—Oconee Co. Clemson College, 1906, *H. D. House*, no. 1861. GEORGIA:—North Georgia, 1875, *C. Wright*: Bibb Co. dry woods near Holton, 19—, *R. M. Harper*, no. 1806 (not typical). KENTUCKY:—banks of the Licking River, *C. W. Short*. OHIO:—Lawrence Co. Ironton, April & May, 1892, *W. C. Werner*. MICHIGAN:—Gratiot Co. Alma, sandy swamp, July, 1893, *C. A. Davis*: Ingham Co. campus, Michigan Agriculture College, Lansing, 1899. ILLINOIS:—Lasalle Co. sandstone ledges, Starved Rock, July, 1909, *Greenman, Lansing & Dixon*: Peoria Co. hilly woodlands, Peoria, April–June, 1904, *F. E. McDonald*. IOWA:—Story Co. Ames, April, 1897, *R. Combs*, no. 350. MISSOURI:—rocky banks, Dumas, July, 1909, *B. F. Bush*, no. 5917: Newton Co. rocky banks, July, 1893, *Bush*, no. 85: McDonald Co. rocky banks, July, 1893, *Bush*, nos. 85a. & 85c., July, 1892, no. 30. ARKANSAS:—Benton Co. 1889, *E. N. Plank*: Yell Co. Petit Jean, April, 1903, *H. A. Pilsbry*.

#### 7. *A. laevis*, sp. nov.

*Pyrus Botryapium* Bigel. Fl. Bost. ed. 2, p. 196 (1824); not *A. Botryapium* Borkh. Handh. Forstb. ii. p. 1260 (1803). *A. canadensis* var. *Botryapium* Gray, Man. ed. 1, p. 130 (1848) probably; also ed. 2. *A. canadensis* Gray, Man. ed. 6, p. 166 (1889), Sarg. Silva iv. p. 127 (1892); Brit. & Brown Ill. Fl. ii. p. 237 (1897); Brit. Man. p. 517 (1901); Small, Fl. Se. U. S. p. 531 (1903); Sarg. Trees N. A. p. 360 (1905); Robinson & Fernald in Gray's Man. ed. 7, p. 459 (1908); Brit. N. A. Trees p. 437 (1908).

Arbor humilis irregularis ad 13 m. (43 ped.) alta vel interdum frutex; foliis firmis ovato-ovalibus ovalibus vel ovato-oblongis semper glabris basi subcordatis rotundatis vel raro acutis apice breviter acuminatis margine argute serratis, junioribus luride glauco-purpureis raro viridibus demum viridibus, venis primariis 12–17-jugis irregularibus paulo arcuatis ad marginem reticulatis summis divergentibus, petiolis tenuibus 12–25 mm. longis; racemis plerumque flexuosis pendulis glabris; pedicellis perlongis; floribus grandibus pulchrisque; petalis 12–18 mm. longis; hypanthio campanulato post anthesem infra paulo constricto inconspicuo; sepalis revolutis; ovario ad apicem glabris; fructo purpureo vel atropurpureo glauco.

A tree, when well developed, 13 m. high or less, shrubby in the north: leaves firm in texture, ovate-oval, oval or ovate-oblong, rarely slightly

obovate or elliptical (blade 4–6 cm. long by 2.5–4 cm. wide), subcordate, rounded, or more rarely acute at base; apex short acuminate; margin sharply serrate nearly to the base (except in occasional specimens in which some or all of the lower teeth are omitted), with firm, callous-tipped, usually subulate, medium-sized teeth, and usually rounded sinuses, the body of the teeth usually wanting, or more rarely with acute sinuses and more prominent cuspidate teeth (6–8 teeth per cm.; 35–46 teeth on each side); glabrous from the first or with a few silky hairs, at flowering time one-half to three-fourths grown and lurid-glaucous-purple, rarely bright green, at maturity dark green and slightly glaucous, even the petioles glabrous; primary veins 12–17 pairs, with short intermediate ones, unequally distant, sinuous, slightly upcurving, anastomosing near the margin, uppermost widely spreading; mature petioles slender, 12–25 mm. long: racemes, when well developed, many-flowered, flexuous, drooping, glabrous or nearly so, 3–7 cm. long; pedicels very long, the lower 15–33 mm. long, becoming in fruit (25) 30–50 mm. long: flowers large and showy: petals oblong-linear, 10–18 mm. long: hypanthium campanulate, 2.75–5 mm. broad, glabrous, soon stretched around the summit of the ovary after flowering, very slightly or not at all constricted below: sepals triangular-lanceolate or subulate (2.75) 3–4 mm. long, mostly abruptly reflexed at the base when the petals fall: summit of the ovary glabrous: fruit purple or nearly black, glaucous, of fair quality, when half grown often broader than long. FIGS. 7 A–G.

Flowers appearing with the leaves in early spring; fruit ripe in June in the latitude of Massachusetts and New York. On damp wooded slopes and banks, or in fields where not too dry, or at the edge of swamps, in calcareous and non-calcareous soil, from Newfoundland throughout New England, westward to Michigan and Kansas; and southward along the mountains to Georgia and Alabama. Type in Gray Herb. “near Aqueduct Bridge, Wellesley, Massachusetts, May & June 1911” *Wiegand*.

Forma **nitida**, f. nov., foliis perviridibus nitidis.—Leaves deep green, not glaucous, lustrous. In Newfoundland, and probably elsewhere. Type in Gray Herb. Bishop’s Falls, Newfoundland, July, 1911, *Fernald & Wiegand*, no. 5593.

A more northern species than *A. canadensis*, very common in Newfoundland, and fairly common throughout New England. At Ithaca, N. Y., it grows in the ravines bordering Cayuga Lake, in damp situations, and usually on the south sun-screened side; while *A. canadensis* is found on the dry rocky crests and fields nearby. In central New York it also occurs around swamps. Though a tree in New York and southern New England, it becomes more like a fastigiate shrub in its northern range, especially in Newfoundland. There, also, the leaves are frequently narrower, and a larger proportion of

them have tapering bases. All intermediate gradations occur, however. The fruit in New England and New York is rarely abundant, according to the writer's experience, but in the North the bushes are often heavily laden.

*A. laevis* differs from *A. canadensis* in the size and coloring of the leaves at flowering time, texture and shape of the leaves at maturity, number of teeth, shape of the teeth, length of the pedicels, size of the hypanthium, and length and shape of the sepals. When growing together, the contrast in appearance at flowering time is striking. The loose racemes and bronzy foliage of *A. laevis* give a rich somewhat drooping effect; while in *A. canadensis* the whole tree is pure white and usually stiffer.

The following typical specimens have been examined. NEWFOUNDLAND:—St. Johns, 1911, *Fernald & Wiegand*, nos. 5538, 5568: Whitbourne, 1911, *Fernald & Wiegand*, nos. 5552, 5587, 5591, 5632: Grand Falls, 1911, *Fernald & Wiegand*, nos. 5547, 5578a. QUEBEC:—Quebec Co. vicinity of Montmorenci Falls, June, 1905, *J. Macoun*, no. 66926. NEW BRUNSWICK:—Kent Co. May, 1870, *J. Fowler*. NOVA SCOTIA:—Guysborough Co. Boylston, May–September, 1890, *C. A. Hamilton*: Pictou Co. fence-row near Pictou, July, 1901, *Howe & Lang*, no. 549: Digby Co. edge of pond near Digby, July, 1901, *Howe & Lang*, nos. 265 & 297. MAINE:—Washington Co. rocky woods, Pembroke, July, 1909, *Fernald & Wiegand* (*Fernald*, no. 1884): Hancock Co. Bar Harbor, *F. H. Peabody*: Penobscot Co. Bangor, 1875, *F. L. Scribner*; Orono, 1873, *Scribner*, 1892, *F. G. Gould*, 1888, 1889, 1904, *Fernald*; Stillwater, 1896, *E. D. Merrill*: Somerset Co. Cambridge, 1873–8, *F. S. Bunker*; East Mercer, *Abbie E. Packard*: Knox Co. Camden, top of Mt. Battie (1325 ft.), July, 1903, *K. Furbish*: Kennebec Co. Kent's Hill, Readfield, September, 1892, *K. Furbish*; Fayette, 1878, 1894, *K. Furbish*; Manchester, May, 1874, *F. L. Scribner*: Franklin Co. Rangeley, 1894, *K. Furbish*: Oxford Co. Gilead, 1897, *K. Furbish*: Androscoggin Co. Bear Mountain, Livermore, 1896, *Furbish*; South Poland, 1895, *Furbish*: Cumberland Co. West Baldwin, September, 1900, *Furbish*; Brunswick, May, 1892, *Furbish*: York Co. Old Orchard, July, 1901, *Furbish*; North Berwick, 1893–95, *J. C. Parlin*, May, 1897, *Fernald*; Kennebunkport, July, 1907, *H. J. Koehler*. NEW HAMPSHIRE:—Coos Co. roadside, Whitefield, 1896, *W. Deane*: Grafton Co. Franconia, May, 1892, *E. & C. E. Faxon*; near Flume House, Franconia, 1855, *Wm. Boott*: Carroll Co. Wolfboro, May, 1909, *H. E. Sargent*, no. 22: Cheshire Co. Mt. Monadnock, May, 1895, *J. R. Churchill*, May, 1897, *Rand & Robinson*, no. 617, alt. 2000 ft., May, 1898, *E. F. Williams*. VERMONT:—Orleans Co. roadside, Westmore, June, 1909, *J. R. Churchill*: Lamoiole Co. Johnson, May, 1894, *A. J. Grout*: Rutland Co. Rut-



land, June, 1899, *Eggleston*, no. 1117 & 1185: Windham Co. rocky hill, Westminster, May–June, 1906, *Blanchard*, set 1; Basin Farm Bridge, North Westminster, May–June, 1907, *Blanchard*, set 2: Bennington Co. Pownal, June, 1901, *F. G. Floyd*. MASSACHUSETTS:—Essex Co. Ipswich, *Oakes*: Suffolk Co. Revere, 1877, *H. A. Young*: Middlesex Co. Mystic Pond, 1855, *Wm. Boott*: Norfolk Co. Wellesley, 1907–11, *Wiegand*: Worcester Co. Ashburnham, May, 1896, *Sydney Harris*, May, 1898, *J. R. Churchill*: Franklin Co. sandy thicket near Miller's Falls, May, 1911, *Fernald*: Berkshire Co., Williamstown, summit of Mt. Greylock, June, 1898, *J. R. Churchill*; Savoy, May, 1901, *R. Hoffmann*. RHODE ISLAND:—Providence Co. East Providence, 1902, *J. F. Collins*. CONNECTICUT:—New London Co. rocky bank of river, Groton, May–June, 1901, *C. B. Graves*: Litchfield Co. Winchester, June, 1901, *E. B. Harger*: Hartford Co. roadside, Southington, May–June, 1901, *C. H. Bissell*: New Haven Co. damp woodland, Oxford, May–June, 1901, *Harger*. ONTARIO:—Welland Co. Queenstown Heights, May, 1901, *J. Macoun*, no. 34304. NEW YORK:—Warren Co. May, 1902, *S. H. Burnham*: Tompkins Co. damp woodlands and clearings, Ithaca, 1896–1906, *Wiegand*: Richmond Co. Tocht Hill, Staten Island, April, 1891, *N. L. Britton*. NEW JERSEY:—Sussex Co. High Point, May, 1891, *H. Kraemer*. PENNSYLVANIA:—Sullivan Co. Ganoga Lake, April, 1897, *S. Brown*: Luzerne Co. Lake Lugh, May, 1903, *S. Brown*: Monroe Co. Pocono Plateau, August, 1904, *J. W. Harshberger*: Lehigh Co. Bake-oven Knob, May, 1911, *H. W. Pretz*, no. 3246: Delaware Co. Brandewine, May, 1901, *B. H. Smith*: Lancaster Co. near Safe Harbor, April, 1891, *Heller & Halbach*: Franklin Co. Blue Ridge Summit, May, 1906, *S. Brown & S. S. Van Pelt*. VIRGINIA:—Washington & Grayson Cos. Summit of White Top Mountain, alt. 5678 ft., May, 1892, *J. K. Small*, May–June *E. G. Britton & A. M. Vail*: Augusta Co. Mt. Rogers (Elliott's Knob), alt. 2000–4473 ft., May, 1893, *Heller*, no. 824: Smyth Co. Dickies Creek, June, 1892, *N. L. & E. G. Britton & A. M. Vail*: . . . Co. Mountain Lake, June, 1890, *N. L. & E. G. Britton*. NORTH CAROLINA:—Buncombe Co. Gray Beard Mt., 1901, *Pollard*; summit of Little Craggy Mt., May, 1898, *Biltmore Herbarium*, no. 5615a: Watauga Co. between Shull's Mills and Grandfather Mt., 1891, alt. 4000 ft., *Small & Heller*, no. 239 (not quite typical): Roan Mt., Eagle Cliff, alt. 5500 ft., 1902, *W. A. Cannon*, no. 136: Spring Mt. Park (Western N. C.), 1897, *E. C. Townsend*. KENTUCKY:—*C. W. Short* (in part): Lyon Co. Bluff Spring to Mout, June, 1909, *Eggleston*, no. 4701. TENNESSEE:—steep rocky cliff, Knoxville, May, 1896, *A. Ruth*, no. 13 (not typical). GEORGIA:—Rabun Co. Rabun Bald, June, 1906, *H. D. House*, no. 2283: Lookout Mt. (woods), July, 1898, *A. Ruth*, nos. 284, 292 (in part): Habersham Co. Tallulah Falls, alt. 1600 ft., August, 1895, *J. K. Small*. ALABAMA:—Mobile Co. streams, *C. Mohr*. MICHIGAN:—Keweenaw Co. 1889, *O. A. Farwell*, nos. 48 & 49: Huron Co. dry sandy ground in open woods, Sand Point,

July, 1908, *C. K. Dodge*, no. 72: St. Clair Co. Port Huron, woods and river bank, May, 1838, *D. Houghton*: Ingham Co. near Lansing, May & August, 1887, *L. H. Bailey*: Wayne Co. vicinity of Linden Park, Detroit, 1893, *Farwell*, no. 53: Gratiot Co. river banks, Alma, July, 1893, *C. A. Davis*. INDIANA: — Porter Co. Dune Park, 1903, *Agnes Chase*, no. 2053. ILLINOIS: — Cook Co., Evanston, *P. Price*. WISCONSIN: — Racine or Kenosha Cos. May, 1900, *S. C. Wadmond*: Jefferson Co. woods, Jefferson Junct., July, 1903, *H. Eggert*. MISSOURI: — Iron Co. Pilot Knob, July, 1888, *L. H. Pammel*. KANSAS: — Cherokee Co. rocky woods, 1897, *A. S. Hitchcock*.

Forma NITIDA.

NEWFOUNDLAND: — St. John's, August, 1911, *Fernald & Wiegand*, no. 5567: Glenwood, July, 1911, *Fernald & Wiegand*, nos. 5528, 5638: Bishop's Falls, July, 1911, *Fernald & Wiegand*, nos. 5592, 5593: Grand Falls, August, 1911, *Fernald & Wiegand*, nos. 5548, 5601: Rushy Pond, August, 1911, *Fernald & Wiegand*, no. 5542.

#### 8. *A. BARTRAMIANA* (Tausch) Roemer.

*Mespilus canadensis*  $\delta$  *oligocarpa* Michx. Fl. Bor. Am. p. 291 (1803). *Pyrus Bartramiana* Tausch, Flora xxi. 2, p. 715 (1838). *A. canadensis* & *oligocarpa* T. & G. Fl. N. A. i. p. 474 (1840); Gray, Man. ed. 1-5. *A. oligocarpa* Roem. Fam. Nat. Syn. Rosif. p. 145 (1847); Gray, Man. ed. 6, p. 167 (1889); Brit. & Brown Ill. Fl. ii. p. 239 (1897); Brit. Man. p. 518 (1901); Robinson & Fernald in Gray's Man. ed. 7, p. 460 (1908). *A. Bartramiana* Roem. Syn. Rosif. p. 145 (1847). *A. arguta* Nutt. in Brit. Man. ed. 3, p. 1076 (1907).

Shrub, 0.5-2.5 m. high; stems several together, loosely cespitose-fastigate (alder-like): leaves thin or firm, elliptical, varying to elliptic-oval or elliptic-oblong (average blade 3-5 (7) cm. long, by 15-30 (40) mm. wide); apex from rounded to very acute; base more or less acuminate; margin sharply, often doubly, serrate to below the middle or nearly to the base; teeth very variable, fine, usually abruptly and obliquely acuminate from a broad base, rarely muticous, the point strongly ascending, sinus usually sharp, sometimes rounded (6-12 teeth per cm.; 17-52 teeth on each side, or 4-15 on each side of leaves at ends of shoots); not conduplicate when young but flat or revolute, glabrous from the first except the slightly silky petioles, half-grown at flowering time, at maturity slightly glaucous; mid-rib unusually broad and conspicuous on the upper side; veins indistinct, very irregular, the primary pairs 12-17, irregularly distant, with shorter ones between, often crowded, sinuous, gradually and irregularly curved upward, anastomosing and indistinct in the outer third, the uppermost widely spreading; petioles stout and very short, 2-7 (10) mm. long: flowers 1-2, rarely 3, on each branchlet, one terminal, with others in the axils of the upper foliage leaves: pedicels glabrous, 10-25

(30) mm. long, in fruit scarcely longer (15–30 mm.): flowers small: petals broad and short, oblong-oval or oval, broadest at the middle, 6–9 mm. long: hypanthium 3–6 mm. wide, campanulate below, more spreading above, constricted below on the young fruit and then prominent: sepals 3–4 mm. long, triangular subulate, more or less persistently tomentose within even in fruit, loosely spreading, varying from nearly erect to somewhat revolute: ovary densely woolly at the summit, tapering into the somewhat thickened woolly style-base: fruit large for the genus, 13 mm. in diameter or less, ovoid, dark purple, edible. Flowers appearing rather late; fruit maturing in late July or in August, but not of the best quality. FIGS. 8 A–H.

Damp uplands and borders of bogs, Labrador to mountains of Massachusetts, Adirondack and Catskill Mountains of New York, Pocono Plateau of Pennsylvania, and westward through Canada to northern Michigan and Minnesota.

Easily distinguished from all eastern species by the almost solitary and apparently axillary flowers, and the nearly sessile leaves, which are not conduplicate, but flat or near so when young, as well as by the more tapering summit of the ovary. The teeth of the leaves, also, have a peculiar look which is soon learned by experience.

The following typical specimens have been examined. LABRADOR: — Makkovik, August, 1896, *A. Stecker*, no. 19: Groswater Bay, Hamilton Inlet, inland along the Nascaupée and Crooked Rivers to Lake Michikaman, July, August, 1905, *Dillon Wallace*: Square Island Harbor, July, 1864, *B. P. Mann*: Red Bay, July, 1891, *Bowdoin College Exped.*, July, 1892, *J. D. Sornborger*, no. 20. NEWFOUNDLAND: — St. John's, August, 1911, *Fernald & Wiegand*, nos. 5755, 5757: Whitbourne, August, 1911, *Fernald & Wiegand*, no. 5578: Glenwood, July, 1911, *Fernald & Wiegand*, nos. 5740, 5741: Notre Dame Bay, Dildo Run, July, 1911, *Fernald & Wiegand*, no. 5756: Snooks Arm, August, 1911, *Fernald & Wiegand*, no. 5535: Tilt Cove, August, 1911, *Fernald & Wiegand*, nos. 5745, 5746: Grand Falls, July, 1911, *Fernald & Wiegand*, nos. 5737, 5750, 5754, 5602: Rushy Pond, July, 1911, *Fernald & Wiegand*, no. 5744: Hodge's Hill, July, 1911, *Fernald & Wiegand*, no. 5751: Millertown Junction, July, 1911, *Fernald & Wiegand*, nos. 5738, 5739: Quarry, July, 1911, *Fernald & Wiegand*, no. 5736: Gaff Topsail, July, 1911, *Fernald & Wiegand*, no. 5752: Birchy Cove, Bay of Islands, July, 1910, *Fernald & Wiegand*, no. 3554. UNGAVA: — Lake Mistassini, swampy woods, August, 1885, *J. M. Macoun*. QUEBEC: — Saguenay Co. Eskimo Point near Mingan, June, 1909, *C. W. Townsend*; Mingan, June, 1909, *Townsend*; Seven Islands, August, 1907, *C. B. Robinson*, no. 782: Gaspé Co., Mount Albert, thicket below tableland, alt. 1000 m., August, 1905, *Collins & Fernald*, and northern slopes, July, 1906, *Fernald & Collins*, nos. 233 & 625; Table-top Mountain, alt. 670 m., western base, August, 1906,

*Fernald & Collins*, no. 614; low woods, banks of Grand River, June-July, 1904, *Fernald*: Rimouski Co. damp woods, Bic, July, 1904, *Collins & Fernald*; limestone and limestone-conglomerate ridges, Bic, July, 1907, *Fernald & Collins*, no. 1100: Quebec Co. vicinity of Montmorenci Falls, June, 1905, *John Macoun*, no. 66925. NEW BRUNSWICK: — Serpentine River, July, 1900, *G. U. Hay*, no. 63: Bass River, July, 1875, *J. Fowler*. MAINE: — Aroostook Co. damp woods, Fort Kent, June, 1898, *Fernald*, no. 2314; summit of Mars Hill, July 1893, *Fernald*; low woods near New Limerick, June, 1899, *Fernald & Chamberlain*; Houlton, 1881, *K. Furbish*: Washington Co. border of heath, Lubec, July & August, 1909, *Fernald & Wiegand*, (*Fernald* nos. 1882 & 1883); low woods, Cutler, July, 1902, *Kennedy, Williams, Collins & Fernald*: Piscataquis Co., Mt. Katahdin, August, 1847 *G. Thurber*, 18 (?) *Edward Everett Hale*, South Basin, September, 1898, *E. D. Merrill*, Chimney Pond and North Basin, July, 1900 *Fernald*; low woods, Greenville, July, 1895, *Fernald* no. 257; Brownville, May, 1905, *J. C. Parlin*; granite ledges, top of Buker Mt., East Guilford, May, 1896, *Geo. B. Fernald*: Penobscot Co. wet woods, Patten, August, 1897, *Fernald*; slopes of Mt. Chase, August, 1897, *Fernald*: Somerset Co. north slope of Mt. Bigelow, above 2000 ft., August, 1896, *Fernald*; mountain top, Caratunk, July, 1892, *Fernald*: Franklin Co. Mountain Pond Mt., Greenvale, August, 1894, *K. Furbish*: Oxford Co. low rocky woods around Swan Pond, July, 1901, *J. C. Parlin*, no. 1429; Streaked Mt., Hebron, May, 1897, *J. A. Allen*: Androscoggin Co. South Poland, 1893, 1895, *Furbish*; East Livermore, 1894, *Furbish*: Cumberland Co. rich woods by stream, Scarborough, May, 1903, *Fellows & Fernald*: York Co. Kennebunkport, June, 1907, *H. J. Koehler*. NEW HAMPSHIRE: — Coos Co. Mt. Washington, Lake of the Clouds, July, 1855, *Wm. Boott*, June, 1878, *E. & C. E. Faxon*, July, 1887, *W. C. Cusick*; Tuckerman's Ravine, July, 1888, *E. & C. E. Faxon*, June & August, 1901, *Eggleston*, no. 2369; Huntington's Ravine, September, 1890, *E. & C. E. Faxon*; Cape Horn, elev. 4600 ft., June, 1898, *E. F. Williams*, June, 1898, *J. M. Greenman*, no. 1058; near Crawford House, June, 1881, *E. & C. E. Faxon*: Grafton Co. Echo Lake, Franconia, May, 1892, *E. & C. E. Faxon*; Mt. Moosilauke, July, 1886, *E. & C. E. Faxon*: Cheshire Co. Mt. Monadnock, May, 1895, *J. R. Churchill*, alt. 3000 ft., May, 1897, *Rand & Robinson*, no. 616. VERMONT: — Mt. Mansfield, June, 1893, *Eggleston*, July, 1897, *J. R. Churchill*, *E. F. Williams*: Rutland Co. Blueberry Hill Bog, Rutland, July, 1900, *Eggleston*, nos. 1960, 1963, 1964; Cedar Swamp, Fairhaven, May, 1893, May, 1898, *Eggleston*, June, 1899, *Eggleston*, no. 1119: Windham Co. Grout Pond, Stratton, alt. 2300 ft., August, 1900, *Eggleston*, no. 1962; dry land, roadside, Stratton, alt. 1500 ft., May, 1904, June, 1907, *Blanchard* set 1; in swamp, Stratton, July, 1904, *Blanchard*, set 2. MASSACHUSETTS: — Worcester Co., Mt. Wachusett, *Nuttall*: Berkshire Co., summit of Mt. Greylock, June, 1898 &

1901, *J. R. Churchill*; Florida, top of Hoosac Plateau, July, 1909, *R. Hoffmann*. NEW YORK:— Adirondack Mts., 1898, *W. H. Lewis, Jr.*; Panther Mt., near Little Moose Lake, July, 1906, *Rydberg*, no. 7808, also *S. S. Van Pelt & J. Crawford*; Rifle Notch, northern N. Y., September, 1900, *N. L. & E. G. Britton*: Ulster Co. Slide Mt., May, 1901, *N. L. Britton*. PENNSYLVANIA:— Monroe Co. Naomi Pines, Pocano Mt., July, 1893, *T. C. Porter*; Tobyhanna, July, 1893, *S. Brown*, 1894, *J. Crawford*: Sullivan Co. Ganoga Lake, 1897, *S. Brown*: Dauphin Co. East Mt., Williamstown, May, 1892, *F. E. Lloyd*. MICHIGAN:— Houghton Co., Isle Royale, July, 1909, *W. S. Cooper*: Keweenaw Co. Clifton, June, 1889, *O. A. Farwell*, no. 52d. MINNESOTA:— St. Louis Co. Vermillion Lake, July, 1886, *Arthur, Bailey, & Holway*, no. B407; Tower, June, 1893, *E. P. Sheldon*.

WELLESLEY COLLEGE.

EXPLANATION OF PLATES 95 AND 96.<sup>1</sup>

Figs. A, AA, B, and C. Representative leaves taken from various specimens. D. Calyx, hypanthium, and ovary at the time when the petals fall. E. Same, in vertical section. F. Same as D, but the fruit half mature. G. Same as F, but in vertical section. H. Cross-section of winter bud showing arrangement of leaves (the bud-scales were removed before sectioning).

SEVENTEENTH ANNUAL WINTER MEETING OF THE  
VERMONT BOTANICAL CLUB.

NELLIE F. FLYNN.

THE seventeenth annual winter meeting of the Vermont Botanical Club which was planned to be held in St. Johnsbury the last week in January but was postponed on account of the small-pox scare there was finally held at Dartmouth College, Hanover, New Hampshire, March 29 and 30, in conjunction with the Vermont Bird Club. Some thirty members of both Clubs were in attendance and the meeting was both enjoyable and instructive.

A lengthy program of about forty papers, two thirds of which were botanical, was successfully carried out, and about fifteen new members were elected. A most interesting lecture by Prof. Merritt L. Fernald of the Gray Herbarium on "Some Red Letter Days on the Newfoundland Barrens," illustrated with lantern slides and mounted specimens

<sup>1</sup> Since the plates were printed it has been noticed that the teeth of the leaves of *A. sanguinea* and of the middle leaf of *A. humilis* have been inadvertently somewhat exaggerated in the direction of fineness.